

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1]

[1922

I.—THE DROUGHT OF 1921 AT KEW.

The year 1921 will long be remembered as one of the most unfavourable for the cultivation of hardy trees and shrubs at Kew. At the best of times Kew has much to contend against. The site is flat and low-lying and consequently late spring frosts are very common. Last spring they did great damage. The soil is thin and poor and but ill-adapted to resist the effects of drought, and the evil effects of the sulphur-laden smoke of London can only be realised by those who live on this or similar spots. These conditions are perennial, but added to them during 1921 was a drought unprecedented in the memory of living man. During most of the time from April onwards the weather was sunny. The hottest period of the year was from July 9th to July 20th. During these twelve days the thermometer registered over 85° on eight days, and on three days 90° or more. The hottest day was July 10th, when a temperature of 92·5° was reached. On many days the heat was accompanied by a dry east wind.

During the year the rainfall has been very far below the average as the following table indicates and the soil a few inches below the surface is still, at the close of the year, quite dry and powdery. It is probable therefore that the effects of the drought recorded during the year are unfortunately far from complete and that further losses will have to be recorded during the coming spring.

The table overleaf shows that the average monthly rainfall at Kew during fifteen years was 2·12 in., and that the rainy days per month were 13. For the year 1921 an average of 1·038 per month was recorded, with an average of 8·5 days per month with rain.

The following observations have been compiled by the Curator, Assistant Curator and the Foremen of the different departments and form a valuable, though lamentable, record of the disastrous effects of both the drought and salt water conditions from which the Royal Botanic Gardens have suffered.

Average of 15 years, 1906-20.			1921.	
	Inches.	Number of days.	Inches.	Number of days.
Jan.	2.08	13	2.31	19
Feb.	1.57	15	0.25	2
March	2.03	16	1.22	11
April	1.81	12	1.02	8
May	1.75	11	1.09	12
June	2.18	11	0.24	3
July	2.45	13	0.10	4
Aug.	2.26	14	1.33	10
Sept.	1.84	11	1.62	6
Oct.	2.44	14	0.48	6
Nov.	2.13	13	1.80	10
Dec.	2.93	14	1.00	11
Total	25.47	157	12.46	102

TREES AND SHRUBS.

Amongst evergreens nothing withstood the drought better than hollies, in fact scarcely a single tree has shown any signs of suffering. Yews also have got through very well but some have become thin in foliage. Of all evergreens rhododendrons suffered the worst. Even big bushes of common *R. ponticum*, planted at least fifty years ago, are quite dead in places where they could not be artificially watered. Although the plants in the Rhododendron Dell have made short growths and smaller leaves than usual, they have survived the ordeal very well. But it was only by watering that they were kept alive. It took the whole time of one man the summer through to keep them going. They were watered in turn, but often enough were flagging at one end of the Dell before he had got through to the other. Mountain top rhododendrons with small leaves such as *yunnanense*, *micranthum*, *yanthinum*, etc., have, as one would expect, stood the heat and dryness much better than the bigger-leaved species found in woodland.

Heaths have suffered badly on the whole but there are exceptions. One can understand native and other species from cool elevations suffering, but it might have been thought that *Erica mediterranea* from the hot hills of Spain and S. W. France would have stood the heat well, but more than half of the large groups growing at Kew have been killed outright and most of them injured. The useful hybrid from *E. mediterranea* we call *darleyensis* has suffered equally badly and breadths planted twenty years ago have had to be dug up. But *E. lusitanica*, *E. Veitchii* and especially *E. arborea alpina* have not been hurt. Another ericaceous plant for which the heat and drought have

been too much is *Pernettya mucronata*, large groups of which have been cleared off. But Arbutuses seem to have enjoyed the conditions that have been fatal to so many of their allies.

As one might expect, it has been a bad time for many conifers. Pines have got through very well although they could not be watered; and on the whole, although there are exceptions, our fine collection of cypresses, Thuyas and Taxineae have also got through very well. Of hemlocks (*Tsuga*) and spruces—essentially wet country trees—many have died. Even *Picea Omorica* and *P. orientalis*, the two best spruces for the Thames Valley, have had their numbers sadly reduced. The firs (*Abies*), but ill-suited at Kew in the wettest years are of course more debilitated even than usual. The past summer has shown more than ever how desirable is the foundation of a national pinetum in some more favoured spot.

Owing no doubt to the heat of the summer *Prumnopitys elegans* bore hundreds of its small plum-like fruits, and *Taxodium distichum* carries a good crop of cones. Neither of these, so far as we know, has borne fruit at Kew before, although the larger, older trees of *Taxodium* in the neighbouring Syon Park have done so. The production of a large number of pomegranates on a bush outside the south end of the Mexican House was an unprecedented event at Kew and aroused much popular interest. A good crop of fruit such as was to be seen on the Californian buckeye (*Aesculus californica*) is rare. But on the whole it has not been a good year for ornamental fruit bearers. The precocious growth and late frosts of spring destroyed much bloom and young fruit and the drought prevented the proper development of such as survived. The thorns were fairly good, but neither barberries, cotoneasters nor crabs have been up to the average. Amongst barberries the best have been the *Wilsonae* group from China which includes *subcanaliculata* and *Stapfiana*.

It was the same with the autumn colouring of the foliage. A fine summer is usually conducive to high colouring but this year the leaves of many trees seem to have been too desiccated for the necessary chemical changes to take place. *Rhus cotinoides*, usually one of the most beautiful and regular of autumn colouring trees at Kew, had its leaves shrivelled or fallen before the ordinary season of colour.

It is often difficult to estimate the damage done to deciduous trees and shrubs. On some of the large beeches in the woods the leaves have withered and remained on the branches—always a bad sign, but it has happened before and they have survived. We shall not be able to tell what the effects of 1921 have been on the woods at Kew till next year, but no doubt the end of many old trees there that were already failing will be hastened, even if they survive for the present. Many birches, poplars and elms had become denuded of foliage in July and tulip trees lost their leaves early. This premature autumn and fall of leaf probably saved the lives of many of these trees.

The flowering of some July and August blooming shrubs like *Eucryphia* and *Oxydendron* was much shortened by the dryness of the atmosphere, but on the other hand some sun-lovers like *Vitex* *Agnus-Castus*, *Hibiscus syriacus* and *Clematis paniculata* were never so good. The curious *Ephedra campylopoda* also produced its yellow flowers in abundance—a rare occurrence at Kew—and was very pretty. On the whole the effects of the intense heat and dryness were bad for the development and duration of flowers the summer through—some rhododendrons for instance never opened their flowers fully—but there is every likelihood of a splendid show of bloom next spring and summer on those trees and shrubs that have passed through the ordeal safely. A curious effect of the summer has been the autumnal blooming of a good many shrubs whose normal time is spring. *Hamamelis japonica* was in full bloom at the end of October and earlier in the month several hybrid rhododendrons whose proper season is April and May were in flower.

LAWNS.

It is not likely that the lawns at Kew have ever been so scorched since the Gardens became public. Those who have known the place for over forty years can remember no similar effects of drought and heat. It is too early yet to tell how many of the patches at present bare and lifeless looking will recover but it is certain a great change for the better will take place when the ground is once more thoroughly moistened. There are some places, however, like the south end of the Lake, the *Berberis* Dell, the Cedar Avenue and other routes where there is a concentration of traffic which are worn bare and cannot recover of themselves. It was hoped that a good amount of grass seed might have been sown during the autumn but the continuation of the drought through October, when less than half an inch of rain fell, debarred this method of renovation. Re-sowing with grass seed next spring is the only remedy, but the necessary roping-off until the young grass is strong enough to bear traffic again, restricts the free circulation of visitors on crowded days.

ROCK GARDEN.

In the Rock Garden, although it was watered freely, *Primulas*, *Ramondias*, *Gentians*, and other plants of a similar nature suffered badly, many being killed outright. Generally speaking the plants were more stunted in growth than usual, and many kinds ripened off prematurely. *Zauschnerias* in common with other kinds from warmer countries enjoyed the heat and flowered more freely than they have done for many years.

In the frame ground many of the higher Alpine subjects grown in pots and pans succumbed to the excessive heat.

Herbaceous plants in the Natural Order beds were all more or less stunted in growth, *Campanulas* and other shade-loving

subjects being amongst the worst sufferers. Half hardy or tender annuals like *Martynia proboscidea* flowered well and produced fruits, but in many cases the seeds of spring-sown annuals failed to germinate.

HERBACEOUS BORDERS AND FLOWER BEDS.

The effect of the long drought was very marked on the herbaceous borders. In spite of frequent watering most of the plants were very much stunted in growth and in many cases the foliage was scorched and dried. Even such things as Asters (Michaelmas daisies), although watered, felt the effects of the continued drought and their flowering period was much shorter than usual. Kniphofias were also poor for although they dislike damp during winter, they enjoy and are always at their best during a wet summer. Dahlias as a rule grew much taller than usual and generally did not flower with their usual freedom.

Some summer bedding subjects, such as *Heliotropes*, *Salvia splendens*, *Begonia semperflorens*, *Verbenas*, *Phlox Drummondii* and Zonal pelargoniums, seemed to enjoy the exceptionally hot and dry conditions. Of course they were watered, but never overhead, so that the foliage did not suffer from the effects of brackish water.

Hardy Annuals generally proved failures more or less, with the exception of *Eschscholtzia californica* and *Hunnemannia fumariaefolia* which, in common with other Californian plants enjoyed the hot and dry conditions. Seeds of such plants as wallflowers and sweet williams germinated very slowly and irregularly, whilst seeds of daisies and *Myosotis* failed to germinate at all except under glass. Cannas enjoyed the heat and have never been so fine before out of doors.

Roses were already weakened by a severe frost in December, 1920, which caught them whilst their wood was still soft and unripened, and they suffered again from late spring frosts. They were thus in poor condition to cope with the abnormal summer and in consequence made little or no growth until autumn, when heavy dews and cooler conditions came.

THE WATER SUPPLY FROM THE THAMES.

As a result of deficient rainfall on the watershed of the Thames, for many weeks the quantity of water coming over Teddington Lock was negligible, in consequence of which the sea-water gradually found its way farther and farther up the river. The water used for plants at Kew is nearly all obtained from the Thames, being first let into the Lake and pumped thence to the filter-beds and reservoir. On the water from the Lake and from the Thames being analysed it was found that a considerable quantity of saline matter was contained therein. Owing no doubt to evaporation, the water in the Lake was found to be even more salty than the Thames (*see p. 13*). The

effects on the roots of trees and shrubs watered out-of-doors were not noticeable although they were no doubt harmful. But the only alternative to using Thames water was to let them die of drought. The injury was far greater among plants grown in pots and surface rooting herbaceous plants in the open which had to be supplied with water daily. This no doubt resulted in a gradual "salting" of the soil. Its effects were evident early in July when many plants showed signs of ill-health, but this was attributed to the exceptional heat experienced about that time. By the end of August the collections generally showed in the dead and dying leaves of many plants which had previously been in vigorous health that something unusual was happening to them. The exceptional heat made it necessary to water and syringe often and copiously, and in the belief that drought was the evil the gardeners were instructed to supply more and more water both at the root and overhead.

The Temperate House is provided with four large storage tanks for conserving rain water, and this supply held out until mid-August, when Thames water had to be used. In no house was the damage more in evidence than in the section which is filled chiefly with Himalayan Rhododendrons. The foliage of many was badly injured within a few days after the Thames water was used, and in some cases the young shoots were killed outright; this continued for at least two months after the use of the Thames water had ceased. In addition to the leaf injury there is the very serious effect the salt has had on the health of the plants. A large number of seedlings of new Chinese Rhododendrons were killed, although kept carefully shaded.

On the other hand many Australian, New Zealand and Tasmanian plants in the Temperate House do not appear to have been injured by the water. These include the Australian Acacias, Callistemons and other myrtaceous plants.

In the Mexican wing of the Temperate House many plants were injured, some of them being entirely denuded of foliage at an early stage of the trouble. The worst sufferers were *Jacobinia*, *Strobilanthes*, *Psidium*, *Oreopanax* and *Trevesia*. Several of these were handsome specimens and they were entirely ruined. A tree of *Ficus religiosa* 30 feet high lost every leaf, and a large specimen of *F. lyrata* was killed outright. Tree ferns, which have been a striking feature in this house for many years, showed early signs of injury. The specimens of *Cyathea Dregei* and *Hemitelia capensis* lost all their leaves. Other tree ferns which were damaged were *Dicksonia antarctica*, and *Cyathea medullaris*. *Cyathea dealbata* was not injured. Of the smaller ferns *Pteris semipinnata* var. *gigantea* and *Davallia platyphylla* were killed to the ground.

Among Chilean plants, two out of three examples of *Embothrium coccineum* were killed; a bushy specimen of *Tricuspidaria dependens* was killed, and *T. lanceolata* was badly injured. Four out of five plants of *Lomatia ferruginea* were killed; the only

surviving plant has never been watered with Thames water and is quite healthy.

The importance of providing an adequate supply of rain water for plants cultivated under glass at Kew was clearly demonstrated in the Temperate House. Plants which were supplied with rain water only have thriven throughout the whole of this extraordinary hot and dry year, whilst the same kinds of plants which were watered with Thames water are either dead or badly injured.

The collection of Orchids comprises many species of such large genera as *Coelogyne*, *Dendrobium*, *Cattleya*, *Masdevallia*, *Odontoglossum* and *Catasetum*, many other smaller genera being represented by only a few or even a single example. Orchids generally require water that is pure, and they object to lime and salt. The collection has suffered severely from salt poisoning, and it is doubtful if many of the plants can recover. The need for an increased storage of rain water for the T Range is abundantly evident in the effects produced by using Thames water for the Orchids. Tropical plants in the same group of houses, most of which require abundance of moisture both at the roots and overhead, have suffered severely from damage by the salt water. The *Nepenthes* made very little growth and few pitchers compared with those of previous summers. *Marantaceae*, *Musaceae* and *Scitamineae* were greatly damaged by the salt, only very few of the large number of plants belonging to these three orders being sufficiently presentable to be left in the houses open to the public. The collection of *Begonias* has been utterly ruined, the bulk of the plants being either killed or very much injured. Many tropical *Leguminosae* were injured. The large plant of *Amherstia* in House No. 1 had all its leaves damaged, except those near the top, which the water from the syringe did not reach. *Camoensia* lost nearly all its leaves, as also did the *Heveas*. All the species of *Coffea* and a large bush of *Cacao* were among the worst sufferers.

Aroideae in House No. 1 have with few exceptions escaped injury, the *Alocasias* being the worst sufferers. The succulents in House No. 5 show no ill effects although they were regularly watered and hosed with Thames water. They include *Cactaceae*, *Euphorbiaceae*, *Liliaceae*, *Amaryllidaceae*, *Bromeliaceae*, *Solanaceae*, *Crassulaceae*, *Saxifragaceae*, *Geraniaceae*, *Compositae*, *Cucurbitaceae*, *Asclepiadaceae*, *Dioscoriaceae*, etc. Tropical Ferns were fortunately watered with rain water only, there being a large and ample supply collected from the roofs of the houses and stored in large tanks. The growth and general health of these plants have been unusually good this year.

The following is a list of greenhouse plants which were injured by Thames water :—

Abutilons,	Leaves injured
Achimenes	" "
Agapetes buxifolia	" "

<i>Asystasia bella</i>	Leaves injured
<i>Begonias</i>	" "
<i>Bouvardias</i>	" "
<i>Bredia hirsuta</i>	Plants nearly killed
<i>Buddleia officinalis</i>	Leaves injured
<i>Calceolarias</i>	" "
<i>Calceolaria Burbidgei</i>	Killed outright
<i>Capsicum annuum</i>	Growth arrested and leaves injured
<i>Centropogon Lucyanus</i>	Leaves injured
<i>Coleus Blumei</i> vars.	Growth arrested.
" <i>shirensis</i>	Nearly all killed
<i>Cuphea micropetala</i>	Leaves injured
<i>Cytisus fragrans</i>	" fell off, growth stunted.
<i>Ericas</i>	Growth arrested, young small plants killed.
<i>Fuchsias</i>	Leaves injured and growth arrested
<i>Impatiens Sultanii</i> , and <i>Holstii</i> vars.	Growth arrested, leaves fell off
<i>Isoloma hirsutum</i>	Leaves injured
<i>Jacobinia chrysostephana</i>	" "
<i>Loropetalum chinense</i>	" "
<i>Luculia gratissima</i>	" "
<i>Plumbago capensis</i>	" "
<i>Pomaderris phyllocaefolia</i>	Young plants killed
<i>Primula sinensis</i>	Leaves injured
<i>Reinwardtia tetragyna</i>	" "
" <i>trigyna</i>	" "
<i>Rhododendrons</i>	Nearly all show leaf injury. This is very marked in <i>R. indicum</i> vars. and <i>R. Oldhami</i> , which lost most of their leaves
<i>Roupala Pohlii</i>	Leaves injured
<i>Salvia rutilans</i> , <i>splendens</i> , <i>leucantha</i> , and <i>involucrata</i>	All more or less injured
<i>Senecio grandifolius</i>	Leaves injured.
" <i>Petasites</i>	" "
" <i>cruentus</i> vars.	Many plants killed
<i>Streptosolen Jamesonii</i>	Leaves injured, many plants nearly killed
<i>Strobilanthes isophyllus</i>	Leaves injured
<i>Tetratheca pilosa</i>	Nearly all killed
<i>Tibouchina semidecandra</i>	Young plants all killed
<i>Musa Ensete</i>	Leaves injured
<i>Freesias</i>	A large batch of seedlings much injured

On syringing overhead being discontinued, the plants made healthier growth, but in most cases they are spoilt for this year.

Among the plants that do not appear to have suffered from salt poisoning although regularly watered with Thames water are :—

Coleus barbatus	These are among the first to suffer from unfavourable conditions, such as fog.	Chrysanthemums
„ thyrsoides		Cyclamen
Pycnostachys Dawei		Epacris
Moschosma riparium		Eranthemum pulchellum
		Eupatoriums
Acacias		Humea elegans
Carnations		Kalanchoes
Grevilleas		Leptospermums
Buddleia asiatica		Nerium
Boronias		Pelargoniums
Camellias		Phaenocoma prolifera
		Pimeleas
		Statice

In the Herbaceous and Alpine department many of the plants were watered overhead almost every morning with Thames water. A large collection of Saxifrages grown in pots was severely damaged by the salt and many other plants in pots were either killed outright or much injured. These included the following :—

Androsace Laggeri	Pentstemon arizonicus
Asperula cynanchica	„ Davidsonii
Androsace pyrenaica	„ Menziesii
Dianthus alpinus	„ ovatus
Douglasia laevigata	„ pubescens
„ Vitaliana	„ rupicola
Geranium subcaulescens	Potentilla nitida
Globularia bellidifolia	Phlox Douglasii
„ nana	Shortia galacifolia
Lewisia Cotyledon	Spiraea pectinata
Lithospermum graminifolium	

In the Rock Garden much damage was done by the water. Some of the worst affected were :—

Achillea argentea	Hypericum confertum
„ umbellata	Lysimachia Henryi
Dryas lanata	Inula ensifolia
„ integrifolia	Primula, nearly all the species
„ vestita	Rhododendron kamtschaticum
Dracocephalum Isabellae	Saxifraga cordifolia
Calceolaria plantaginea	„ oppositifolia (large patches killed entirely)
„ polyrrhiza	„ cuneifolia
„ John Innes	„ caesia
Douglasia Vitaliana	„ squarrosa
Gentiana sino-ornata	Tiarella cordifolia
„ Farreri	

The effect of the water on growth was in many cases very marked; some plants went to rest prematurely whilst others grew stunted and weak. The effect in the Herbaceous Ground was pretty much the same, Campanulas being among the worst sufferers.

II.—THE KEW LAWNS AND THE DROUGHT.

(An account of observations made during the second and third weeks of August, 1921.)

W. B. TURRILL.

The abnormally dry summer of last year provided the opportunity for making, at the suggestion of the Assistant Director, a number of observations on the resistance of lawn plants to drought. While the results of these observations are in no way unexpected it has been thought advisable to place them on record in a short article.

It is well known that grasslands require constantly recurring, rather than heavy, precipitation to reach perfection or to keep continuously green. This fact has been well emphasised by A. W. F. Schimper, *Plant Geography*, p. 174, and is further illustrated by the distribution of the best grasslands in the British Isles. This being so, it would naturally be expected that lawns, meadows and pastures would be amongst the first plant associations to suffer in a prolonged spell of dry weather. On the other hand, relatively quick recovery usually follows a sufficient rainfall, the rain soon reaching to the roots and stimulating the development of fresh vaginal shoots in the perennial species, and the germination of dormant seeds of some of the annual ones. Even after last summer's drought the turf at Kew was becoming green again by Aug. 19th after the showers of the preceding week, and numerous new green shoots, an inch or more high, were to be found on many of the lawns.

Most of the Kew lawns at the beginning of August looked parched and dry, and only in a few hollows, or in places artificially watered, was the grass as a whole really green. In hollows the water in the soil and subsoil would naturally be greater in amount than where the surface is level. Again, the presence of a conspicuous green margin to or ring around those flower-beds, trees or shrubs, which were watered during the dry weather, showed how a comparatively small sum total of water is required to keep grass fresh. A bright green patch of grass during the drought and away from a watered bed, tree or shrub, was almost invariably found to indicate the presence of a hydrant from which water had been withdrawn. Two conclusions are obvious, that the drying up of the grasses was due directly to lack of water in the soil and subsoil, and that the survival in a green state of any portion of lawn is due mainly, not to a difference in floristic

composition, but to position in regard to water supply or conservation. Nevertheless, detailed investigations of typical portions of the Kew lawns revealed some facts indicating that there are differences between species of grasses and other lawn plants in their power of drought resistance.

One of the commonest of the grasses in the Kew lawns is *Lolium perenne*, and green plants and even dull green patches of this could be found in most areas where excessive tramping by visitors had not worn the turf away. Indeed, of the grasses normally present, the perennial rye-grass claims first place as a drought-resister. Yet, on many of the fully exposed lawns, it eventually became, last summer, as parched as its associated species. Species of *Poa* and *Festuca* were almost entirely absent in the green state from unwatered spots. Only one patch, not far from the Main Gate, of *Festuca ovina*, remained partially green, and individual plants were also found near the Temperate House. That *Lolium* should often survive green while species of *Festuca* should almost always become parched is difficult to explain. Anatomically the leaves and shoots of *Festuca ovina*, *F. duriuscula* and other species, are xeromorphically constructed with their often subulate, rolled or folded leaves, in which the stomata are well protected in grooves on the inside of the leaf which possesses much sclerenchymatic tissue around the vascular bundles. *Lolium perenne* has, on the contrary, leaves and shoots typical of a mesophytic grass, being glabrous with shallow grooves, not specially protected stomata and very little sclerenchyma, that which is present not forming girders to the vascular bundles. It is possible that an explanation is to be found in the root-system, for *Lolium* is a deep-rooted, generally tufted grass, and its subterranean system would appear to be more extensive than that of some, at least, of the common species of *Festuca* and *Poa*. That the root and rhizome system is of considerable importance is also shown by the survival of *Agropyron repens*. This plant is, of course, not a normal constituent of lawns, but some considerable patches occur in the grass near the Herbarium. The grass here was, in spring, chiefly composed of *Arrhenatherum avenaceum*, *Alopecurus pratensis*, *Festuca duriuscula*, *Poa pratensis* and *Dactylis glomerata*. Hay was cut early in June and by August very few remains of the named grasses were to be seen above ground. A tall green growth of *Agropyron repens* had taken their place over part of the ground which had certainly not been watered. The leaves of the couch-grass are not markedly xeromorphic in structure and the extensive underground stolons are its most noteworthy characteristic and would also account for its vegetative development during dry weather. Partly green specimens of *Agrostis*, which were found in the lawn near the Kew Palace and others near the Temperate House, would also appear to owe their preservation to nodal rootings and stolon production. A few of the coarser grasses survived in places. A green patch of *Dactylis glomerata* was observed

near the Pagoda and isolated plants of *Holcus mollis* and *H. lanatus* no doubt survived owing to their hairy covering on stems and leaves.

It was to be expected that annual grasses, even including the ubiquitous *Poa annua*, should disappear and, though not without exceptions, it seems a rule that amongst the perennial grasses the earlier flowering species can least withstand drought. Thus *Poa pratensis*, *Alopecurus pratensis*, *Phleum pratense*, *Arrhenatherum avenaceum*, *Avena pubescens*, *Cynosurus cristatus*, *Bromus* spp. and other grasses which are common constituents of the Kew turf had quite died down by the middle of August. *Lolium perenne* flowers most of the summer and *Agropyron repens* is a later flowering grass than those mentioned above.

The Sun Dial Lawn, in front of Kew Palace, was ploughed up during the war but has now been completely resown. A portion laid down with seed in the spring of the year before last was much dried up but was still greener than similar areas of old lawn. *Lolium perenne* was the most conspicuous grass, and associated with it were green, low-growing plants of *Medicago lupulina*, *Trifolium repens* and *Trifolium pratense*. The second portion, resown last spring, had not yet been cut and was the greenest part of the Gardens, *Lolium perenne* was again the dominant grass, with patches of *Holcus lanatus*. From amongst the green *Lolium*, dried up and dead plants of a species of *Poa* were picked out. The dying out of these, and doubtless individuals of other species, had retarded the formation of turf and allowed the entrance of many weeds of which numerous individuals of the following species were green and flourishing: *Nasturtium sylvestre*, *Coronopus didyma*, *Solanum nigrum*, *Polygonum aviculare*, *P. persicaria*, *Plantago lanceolata* and *Chenopodium album*. A small patch of vivid green surrounding a hydrant within this sown portion showed what the turf would have been had the summer been a wet one. That newly-sown lawns remain green longer in drought than established ones, is probably due to the looser nature of the soil in the former, allowing the roots to penetrate more deeply and to spread further. Telluric water can also rise by capillary action more easily to the superficial layers in which the plants are rooted.

In conclusion, a few facts may be recorded regarding plants other than grasses. The greenest constituents of the turf were members of the *Compositae*. *Achillea millefolium* retained its leaves green throughout the drought, and other, less valuable lawn plants, which remained fresh were *Hypochaeris radicata*, *Hieracium pilosella*, *Crepis virens*, and also *Plantago lanceolata*. Near the T-range a portion of lawn has been invaded by the chamomile, *Anthemis nobilis*. This remained as fresh as *Achillea* and was flowering and fruiting vigorously. Many of the patches appeared to indicate circular spreading from a centre and a few showed "fairy-ring" structure quite well. All of these plants have deeply penetrating tap-roots or, like *Achillea*, a much

developed system of stolons beneath the surface of the soil, again indicating the importance of the underground system in drought resistance.

III.—SALT IN THE KEW WATER SUPPLY.

W. B. TURRILL.

At the request of the Director a series of analyses to determine the salt-content of the Kew Water Supply was commenced by the writer in September 1921, and continued intermittently till the end of the year. Since some of the results obtained were striking, at first unexpected, and have a practical bearing, it has been thought advisable to publish a short summary of them. Copies of the reports, giving full details of the collection of the water and mud samples, and also of the analytical methods employed, are preserved at the Director's Office and in the Kew Library.

An account of the Kew water system is given in the *Kew Bulletin*, 1897. p. 334. Briefly it may be stated that water is allowed to enter the Lake, as required, from the river immediately opposite, at certain high tides. From the Lake it passes to filter beds in the Gardens, and is then pumped up to a reservoir in Richmond Park, from whence it comes back to the Gardens under considerable pressure.

Preliminary experiments showed that the water in use at Kew during August and September contained considerable quantities of chloride, mostly in the form of sodium chloride. On this basis it was decided to analyse samples taken from the Lake and from the River Thames at different states of the tide. The results were calculated both in terms of chlorine and of chlorides, considered as sodium chloride. For the purposes of this note we may quote the results throughout as grams of sodium chloride per 1000 cc. of water. Altogether over 20 distinct samples have been analysed in the course of the investigations.

Six samples of water were collected on September 15 and 16, and their analysis brought to light the fact that the lake water, at this time, was 10 times as salt as the river water, collected immediately opposite the inlet to the Lake at high tide. It was obvious that the immediate source of salt water at Kew was the Lake. The river water contained between 0.15 and 0.18 grams of NaCl per thousand, varying slightly at different levels, and the Lake water 1.5. It was suggested that the concentration of salt in the Lake might be due to one or both of two causes:—(1) Considerable, and abnormal, evaporation during the hot summer. (2) Tidal or river conditions other than those occurring when these samples were taken. Finally it has

been shown that during 1921 both causes operated and in the same direction, but evidence of extra-salt tides was not immediately forthcoming. Following the results obtained by the first set of analyses the Lake was emptied of water and refilled several times from the river. Analysis then showed that the salt content had been reduced to 0.424 grams per 1000 cc. of water.

The first tidal barrier in the Thames is at Richmond, where the lock and weir are usually manipulated as a half-tidal barrier, the first full lock being at Teddington. Samples of water were obtained from above Richmond Lock at high and low tides and contained respectively 0.2 (3.10.21.) and 0.1 (16.9.21.) grams of salt per 1000 cc. of the samples. There was thus only a slight difference in salt-content between the surface river water at high-tide at Kew and at Richmond. Indeed the Richmond water, as analysed, contained slightly the more salt, but that is explained by small variations noted for different tides throughout the course of the work. A sample collected from the Thames at Hampton Court (3.10.21.) contained 0.117 grams of sodium chloride per 1000 cc., that is, practically the same as the water at low tide at Richmond.

In order to determine if the mud of the Lake held any considerable quantity of salt, known weights of wet mud were stirred with known volumes of cold and hot distilled water respectively. With cold water 0.585 grams of salt were extracted from 1000 grams of mud, and with hot (boiling) water 0.83 grams. The amount of water held in the mud ("mud-water") was then found by experiment, and by calculation 1.38 grams of salt was shown to be associated with 1000 grams of mud-water. This calculation on the "mud-water" basis shows, of course, a richer salt content than the calculation on the basis mud plus water ("wet-mud"). There seems every probability that during the latter part of the summer the mud and water left behind when the lake was drained as far as possible, contained enough salt to affect temporarily the next supply of water, but insufficient to be considered a permanent cause of salinity.

It was not till the week ending November 5th that definite evidence of extra-salt tides was obtained. During the week very high tides were experienced in the Thames estuary. Two samples taken at Kew contained 1.14 grams of sodium chloride and 1.2 grams per 1000 respectively, as compared with 0.15 grams per 1000 which appears to be about the average salinity of the Thames water at Kew. During these very high and extra-salt tides fresh water fish (barbel) came to the surface and sides of the river in shoals. They showed obvious signs of being affected by the incoming tide and many were caught with the hands or in hand-nets.

The conditions which cause the increased salinity of the Kew water have thus been shown to be due directly to the drought

of the past summer, but the action has been a double one. In the first place a very much reduced quantity of fresh water has been drained from the Thames basin down the river. The river throughout its entire course has been relatively sluggish and this would tend to greater evaporation for any given mass of water and consequent increase in salt-content. The salinity of Thames water, however, is due mainly to carbonates and these have not been considered in the work summarised above. The small quantity of fresh-water coming down has meant that at Kew the salt tidal water has come up higher and in greater quantity than is normally the case. Whether mixed with fresh water, or pushing it back and flowing with it in more or less separate layers, the salt sea-water coming up the Thames estuary at high tide, and most especially at spring tides, is the ultimate source of the salt in the Kew water supply. In this connection it is interesting to note that during the last summer seaweed came up as far as Kew Bridge. Thus at extra-salt tides, just now and again during the summer, decidedly salt water was let into the Kew Lake. This is a shallow basin giving the contained water a relatively large superficial area for evaporation compared with its bulk. This helps to account for a marked concentration of salt in the Lake itself during last summers' heat. It is probable that the water as supplied for watering purposes in Kew Gardens is often more salt, especially in summer, than fresh river-water, which in the case of the Thames normally contains very little sodium chloride. The conditions of drought and heat aggravated this state during the past year by reducing the quantity of fresh water coming down, and therefore increasing both the relative and actual amount of salt sea water coming up, and also by increasing the concentration of salt through evaporation of the water in the Lake, which for the time being was tending to become a miniature Dead Sea.

IV.—FURTHER NOTES ON THE AUSTRALIAN SPECIES OF STIPA.*

D. K. HUGHES.

In response to the communication of a copy of Miss Hughes' paper "A Revision of the Australian Species of Stipa," published in the *Kew Bulletin* of last year, pp. 1-30, Mrs. A. Chase, on the behalf of the United States National Herbarium, asked for the revision of their Australian Stipas by Miss Hughes. The proposition was all the more welcome as the Washington collections

* See *Kew Bulletin*, 1921, 1.

contained much additional material, among it species which Miss Hughes had been obliged to place among the "dubiae." The present "Notes" are the result of her examination of these collections. It is very satisfactory that her conclusions, tested on a considerable number of new specimens, were found to hold good in nearly all cases. As to the "dubiae," one of Reader's species, *S. acrociliata*, was recognised as an accession to her list of Australian species, whilst another, *S. eremophila*, was found to cover the bulk of *S. rudis*, as understood by Miss Hughes, but not the original *S. rudis* of Sprengel, which, on the examination of a better co-type, has turned out to be *S. pubescens*. A third species, *S. Luehmannii*, proved to be the *S. Drummondii* of Steudel, and a fourth, not accounted for in her original paper and missed in the *Index Kewensis*, takes now the place of her *S. lachnocolea*. The other "dubiae" are all species, the elucidation of which will require the consultation of continental herbaria. Two further additions to the list of Australian species resulted from her examination of specimens collected in New South Wales by R. T. Baker and F. v. Mueller respectively. Interesting is the discovery that *S. aristiglumis* of F. v. Mueller was based on a really non-existent character which by the rules of nomenclature will yet remain evident in the name of the species.

The number of species of *Stipa* in Australia is brought up to 42 by the "Notes," whilst 6 are left among the "dubiae."

O. S.

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1. ***S. elegantissima***, *Labill.*, Pl. Nov. Holl. i. 24, t. 29.
W. AUSTRALIA. Killerberrim, *Vachell*.
S. AUSTRALIA. Roseworthy, 11.xi.1889, *Tepper*.
NEW SOUTH WALES. Murray River, *Mueller*.
VICTORIA. Near Bacchus Marsh, *Tovey* and *French*.
 3. ***S. Muelleri***, *Tate*, Trans. Roy. Soc. S. Austral. vii. (1885) 70.
VICTORIA. Emerald, *P. St. John*.
 5. ***S. teretifolia***, *Steud.*, Syn. Glum. i. 128.
VICTORIA. Brighton, *Mueller*.
 12. ***S. falcata***, *Hughes* in *Kew Bull.* (1921) 14.
N. S. WALES. Hunter's River, Capt. Wilkes' Expedition;
Belltrus via Scone, *White* 17; Liverpool Plains (*coll.* ?).
 14. ***S. variabilis***, *Hughes* in *Kew Bull.* (1921) 15.
N. S. WALES. Sydney, *Maiden*.

Further material of the group *Falcatae* shows forms intermediate between *S. falcata* and *S. variabilis*.

S. falcata, as understood at present, comprises shorter plants with dense tufts of fine very scabrid basal leaves and extremely

short basal sheaths. *S. variabilis*, although of very varying habit, possesses leaves which are generally longer, coarser and more loosely convolute than in *S. falcata*, their lower epidermis being smooth or slightly pubescent but not scabrid, whilst the tufts are less dense and the basal sheaths are longer. Continued study will be necessary to determine the value of those differences. Comparison of this material with *S. Drummondii* has proved its distinctiveness from that species.

The specimens enumerated under *S. variabilis*, collected at Kauring by Stoward (nos. 361, 459, 466), might rather be included in *S. falcata* on account of the slightly scabrid leaves, but they represent a coarser plant than the type and do not conform well with either species.

15. *S. Drummondii*, Steud., Syn. Glum. i. 128. *S. Luehmannii*, Reader in Vict. Nat. xvi. 158.

N. S. WALES. Liverpool Plains, (coll. ?).

VICTORIA. Little Desert, Lowan, 19.XI.1899, Reader.

Reader's plant quoted above is no doubt an authentic specimen of *S. Luehmannii* though collected a year later than the type ("Sandy Desert, Lowan, 1898"). On the sheet examined there are two plants, both densely tufted with softly pubescent leaves and sheaths. The smaller of the two has convolute leaves about 7 cm. long and about 3 mm. wide when flattened out, and agrees with the type of *S. Drummondii* (Drummond 378). The larger plant has convolute lower leaves, while the upper are mostly unrolled, about 17 cm. long and 5 mm. wide. The flowering culms are very stout, loosely enclosed by sheaths up to 1.4 cm. wide. This is a far more luxuriant form than the typical *S. Drummondii*, but intermediates are seen in the specimens collected by J. M. Black in S. Australia.

The chief distinguishing character emphasised by Reader in his description of *S. Luehmannii*,—the toothed unequal empty glumes,—is also found in *S. Drummondii*, Steud.

17. *S. platychaeta*, Hughes in Kew Bull. (1921) 16.

N. S. WALES. Murrumbidgee River, 1886, Bennett.

18. *S. scabra*, Lindl. in Mitch., Trop. Austral. 31.

N. S. WALES. Gilgunnia, Baker; Nyngan, Baker; "N. Western area," 1912, Boorman.

Comparison of further material shows that the length of the ligule varies from 1–3 mm. and cannot therefore be relied upon as a character for diagnosis if not accompanied by other distinguishing features. Otherwise the specimens quoted above are fairly uniform and in keeping with Mitchell's type.

20. *S. densiflora*, Hughes in Kew Bull. (1921) 18.

N. S. WALES. Lake Andgellica, Boorman.

Boorman's plant differs from the type (Etheridge) in having larger spikelets with unequal glumes, the lower being 1.8 cm. long and the upper 1.4 cm. long. The valve is 7 mm. long with a tuft of hairs about 2 mm. long at the apex and the awn 4.8 cm. The hairs on the valve are longer than in typical *S. densiflora*, while those on the awn are slightly shorter.

21. *S. hemipogon*, *Benth.* Fl. Austral. vii. 569.

W. AUSTRALIA. Parker's Range, 1890, *Merrell*.

22. *S. nobilis*, *Pilg.* in *Diels and Pritz.*, *Fragm. Phytog. Austral. Occ.* 70. in *Engl. Jahrb.* xxxv. e descr.

VICTORIA. Near Dandenong Ranges, 1891, *Dixon*.

The three species *S. mollis*, *S. nobilis* and *S. semibarbata* are very closely allied. The following differences will supplement or amplify those already given in the Key.

In *S. mollis* the hairs of the long flexuous awn are present all along the bristle except at the extreme tip, and are about 2 mm. long. The bristle is very long, usually about 6-7 cm.

In *S. nobilis* the hairs are usually denser and longer (2-3 mm.) than in *S. mollis* or in *S. semibarbata*, and are not continued beyond a few mm. of the base of the bristle, which varies in length between 4 and 6 cm. and turns black at maturity. In this, as in the preceding species, the column of the awn does not exceed 2.5 cm. in length.

In *S. semibarbata* the column measures 3.5-4.5 cm. The hairs are generally scanty, 1.5-2 mm. long and not continued beyond the column. The bristle rarely exceeds 4.5 cm. but in a few cases has been found to be as long as 6 cm.; it also usually turns black at maturity.

27. *S. pubescens*, *R. Br. Prod.* 174.

N. S. WALES. *Morisett*, *Boorman*; *Awaba*, *Boorman*; *Sydney*, *C. Wright*; *Capt. Wilkes Expedition 1838-42*; *Port Jackson District*, *Camfield*.

See note under *S. eremophila*, *Reader*.

28. *S. eremophila*, *Reader* in *Vict. Nat.* xvii. 154. *S. rudis*. *Hughes in Kew Bull.* (1921) 21, non *Spreng*.

VICTORIA. *Borong*, 28. x. 1904, *Reader*.

After careful comparison this plant was found to agree, not with the type of *S. rudis* (*Sieber Agrost.* 66), but with the other specimens quoted for that species in *Kew Bull.* (1921) 21.

Since writing that enumeration a more complete specimen of *Sieber Agrost.* 66 was lent by the British Museum for examination. The fully matured floret and awn show a marked difference from the other specimens formerly believed to be identical. The hairs of the valve are whitish and the stout column of the awn pale. Thus although the lower glume is only 1.4-1.5 cm. long there seems no character to keep it distinct from *S. pubescens*, *R. Br.* The type of the latter species (*Brown* 6203) has the lower glume

2 cm. long. In *Gunn* 588 the length is 1.8 cm., in *Stuart's* from New England and *Cunningham's* from the Brisbane River it is 1.7 cm. In others a length of 2.2–2.3 cm. is attained. The column of the awn, though constant in texture, colour and indumentum, varies in length from 3.2 cm. (*Cunningham*) to 5 cm. (*Stephenson* 261 and *Lhotsky*). In the present state of our knowledge it would seem that *Sieber* 66 should be placed with *S. pubescens* while *S. eremophila* might include all the other plants formerly referred by me to *S. rudis*, Spreng.

30a. *S. acrociliata*, *Reader* in *Vict. Nat.* xiii, 167.

VICTORIA. Little Desert, Lowan, 18.xi.1896, *Reader*.

This species is allied to *S. tenuiglumis* and *S. elatior*. From the former it differs in having smaller spikelets (lower glume 9 mm. long, upper glume 7 mm. long, valve 6 mm. long) and larger panicles about 30 cm. long, and from both in its several-noded culms and branching habit, the non-convolute leaves 6–8 cm. long and 3–4 mm. wide, and the glabrous ligule about 5 mm. long.

31. *S. compacta*, *Hughes* in *Kew Bull.* (1921) 24.

S. AUSTRALIA. Largs near Adelaide, 6. xii. 1882, *Tepper*.

The lobes of the valves in this species were described as being 1 mm. long. I have examined them again and find that they do not as a rule exceed 0.5 mm. in length, and are sometimes shorter or often only one is developed. *Tepper's* plant is identical in every respect except that the lobes are entirely absent and that the overmature panicle is still partly enclosed in its sheath.

33. *S. aristiglumis*, *F. Muell.* in *Trans. Vict. Nat. Inst.* (1855) 43.

S. fusiformis, *Hughes* in *Kew Bull.* (1921) 25.

N. S. WALES. Hunter's River, Capt. Wilke's Expedition, 1838–42; Sindleton, *Boorman*.

VICTORIA. Shire of Dimboola, *Reader*.

Further microscopic examination of the glumes of *Mueller's* plant shows that the appearance of three teeth or aristulae at their tips is due to the breaking down of the extremely delicate tissue between the very strong nerves. The tips of the glumes are therefore really entire and the total length of the latter must



FIG. 1.—Spikelet of *S. acrociliata*. x3. a. valve. x3. b. valve and awn to show the length of the bristle, natural size.



FIG. 2.—Spikelet of *S. bigeniculata*.
x3. a. valve. x3.



FIG. 3.—Spikelet of *S. effusa*.
x3. a. valve
x3. b. valve

and awn to show the length of the bristle, natural size.

be taken to include the teeth. Taken thus it comes up to at least 1.1 cm. There is then nothing left to distinguish *S. fusiformis* from *S. aristiglumis*, which latter name will have to stand, although it is misleading. At the same time my description of *S. fusiformis* may be accepted as an emended description of *S. aristiglumis*.

33a. *S. bigeniculata*, Hughes; sp. nov. *S. aristiglumis*, Muell., affinis sed basi densiore caespitosa, foliis tenuibus brevioribus scabridis, floribus majoribus, aristis longioribus, differt.

Perennis, dense caespitosa, usque 50 cm. alta. *Culmi* erecti, teretes, glabri, 2-nodi,

nodis breviter pubescentibus. *Foliorum* vaginæ pallidae, apertiusculæ, striatæ, subpubescentes, basales breves, 1.5–3 cm. longæ, persistentes; *ligulae* breves, ciliatæ; *laminae* setaceo-convolutæ, in acumen pungens attenuatæ, interdum recurvæ, usque ad 10 cm. longæ, scabridulæ. *Panicula* laxa, angusta, 25 cm. longa, et 2–3 cm. lata; axis primarius leviter scaberulus; rami fasciculati, erecti vel leviter patentes, pauciflori; pedicelli gracillimi, 1 cm. longi. *Spiculae* subherbaceae. *Glumae* longe acuminatæ, valvam amplectantes, inaequales; inferior 3-nervis, 1.6 cm. longa; superior 5-nervis, 1.3 cm. longa. *Valva* cylindrica, 7 mm. longa, 0.5 mm. lata, integra, breviter et dense sericeo-pubescent, pilis luteis apice productis 1–2 mm. longis; callus acutus, 0.8 mm. longus; arista 4.5 cm. longa; columna apice mediaque angulo recto geniculata, seta recta 2.5–3 cm. longa, valvula valvam aequans.

N. S. WALES. Cooma, Jan. 1887, R. T. Baker.

36a. *S. effusa*, Hughes; sp. nov. *S. setaceae*, R. Br., affinis, sed ligula brevior usque 1 mm. longa, foliis planis vel laxissime convolutis, glumis minoribus, differt.

Basis incognita. *Culmi* floriferi erecti vel geniculati, minime 5-nodi, glabri, infra nodis scaberulis. *Foliorum* vaginæ apertæ, striatæ, glabrae; *ligulae*

usque 1 mm. longæ, ciliatæ; *laminae* planæ vel axissime convolutæ, usque 30 cm. longæ et 3–4 mm. latae,

striatae, glabrae, interdum scabriusculae. *Panicula* effusa, 22 cm. longa et 3-4 cm. lata; axis primarius teres, praeter nodos ciliatos glaber; rami filiformes, patentes, 1.5-3 cm. longi; pedicelli ad 3 mm. longi. *Spiculae* hiantes, nitidae. *Glumae* acuminatae, integrae, glabrae, dorso scaberulae; inferior 8.5 mm. longa, 1- sub 3-nervis; superior 7.5 mm. longa, 3-nervis. *Valva* pallide brunnescens, tenuis, cum callo 5 mm. longa, sparse hirsuta pilis albis; callus acutus, 1 mm. longus; arista tenuis, 4.5 cm. longa; columna brevissime pilosula vel scabrida, 1.2 cm. longa; seta leviter curvula; valvula valvam aequans.

N. S. WALES. Lachlan River, Sept. 1878, *Mueller*, (received at Washington under the name *S. scabra*, Lindl.).



FIG. 4.—Spikelet of *S. crinita*. a. valve. x3.

38. *S. crinita*, *Gaud.* in Freyc. Voy. Bot. 407.

Subsequent examination of the specimen of *S. crinita*, *Gaud.* sent by the author to the British Museum in 1825 revealed the fact that it consists of two similar but not identical plants.

A. This has a narrow compact panicle exserted from its sheath. The glumes are hyaline with obscure or very short lateral nerves. There are no awns now remaining. Belonging to this is part of a densely tufted base of narrowly convolute leaves. The plant is too incomplete for precise recognition, but probably belongs to *S. falcata*, *Hughes*, or a very closely allied species.

B. This consists of a panicle only, which is very lax and still partly enclosed in its sheath. The lateral nerves of the glumes are prominent and extending almost to the tip. The awns are fine, not falcate, and about 4 cm. long.

Enquiries and drawings of both plants were addressed to the Museum d'Histoire Naturelle, Paris, when M. Gagnepain kindly made the following observations. "Nous n'avons pas de *Stipa crinita*, *Gaudichaud* de la main de ce botaniste; mais seulement un *S. flavescens* *Nouv. Holl. Port Jackson*, *C. Gaudichaud* de son écriture même.

Je soupçonne que c'est l'échantillon sur lequel il a basé son *Stipa crinita*. Ce specimen n'a pas de souche, ni les feuilles inférieures; mais une feuille moyenne, une feuille supérieure et une inflorescence de 20 cm., abondamment pourvue d'épillets. La feuille la plus grande mesure 22 cm. et 2-3 mm. de large; elle est roulée. En examinant soigneusement les épillets nombreux de ce *Stipa* (*flavescens*?) je reconnais très facilement le dessin B: glumes vertes scabres sur la nervure médiane, les 2 nervures latérales assez fortes atteignant presque le sommet; caryopse à appendice tordu, scabérule, présentant de place en place une zone verte formée de 2 nervures vertes longitudinales, contiguës, qui par la torsion se sont disposées en spirale, à spires équidistantes. Quand les glumes sont sèches, elles prennent

l'apparence hyaline, scarieuse, mais les 2 nervures latérales sont toujours évidentes jusqu'au sommet.

" Il n'y a rien de A, dont les glumes paraissent appartenir à une autre espèce comme *flavescens*, Labill par exemple.

" Il ne serait pas extraordinaire que Gaudichaud ait cru avoir affaire au *Stipa flavescens*, Labill. puisque'il a écrit cette détermination dans notre herbier."

If this, then, is the true *Stipa crinita*, Gaud., the species should be placed, not in § *Aphanoneuræ* as indicated in the Key to the Species but in § *Striatae* near *S. tenuiglumis*.

40. **S. McAlpinei**, Reader in Vict. Nat. xv, (1899) 143. *S. lachnocolea*, Hughes in *Kew Bull.* (1921) 26.

S. AUSTRALIA. Clarendon, *Tepper* 274.

VICTORIA. Little Desert, Lowan, *Reader*.

When raising *S. compressa* var. *lachnocolea*, Benth., to specific rank I was not aware that Mr. Reader had already described it under the name of *S. McAlpinei*.

V.—NEW ORCHIDS: DECAS XLIX.

This Decade of New Orchids was left completed by the late Mr. R. A. Rolfe, A.L.S., at the time of his death.

They have been collected together for publication and represent his last contribution to the study of the *Orchidaceae*, the family on which he was the recognised authority.*

481. **Agrostophyllum seychellarum**, Rolfe; species *A. zeylanico*, Hook. f. (cujus flores ignoti) maxime affinis.

Caules erecti, subcompressi, 1.5–3 dm. alti. *Folia* lineari-oblonga, obtusa vel minute bidentata, 7.5–12.5 cm. longa, 1–1.6 cm. lata; vaginae conduplicatae, imbricatae, striatae, nigro-marginatae, 5–7.5 cm. longae. *Capitula* terminalia, sessilia, densiflora, 2.5–3.1 cm. lata. *Bractea*e oblongae, obtusae vel apiculatae, striatae, imbricatae, 4–6 mm. longae. *Pedicelli* 5 mm. longi. *Sepala* late ovato-oblonga, apiculata, 3 mm. longa, lateralalia subconcaeva. *Petala* ovato-oblonga, subacuta, 3 mm. longa. *Labellum* ovato-oblongum, subacutum, planum, subpetaloideum, 3 mm. longum. *Columna* crassa, 2 mm. longa. *Capsula* ovoideo-oblonga, 6 mm. longa.

SEYCHELLES ISLANDS: Cascade Estate, Mahé, *Thomasset* 156 bis; *Neville*; *Barkly*; *Horne*.

An interesting outlying species which has long been known from fruiting specimens, and the flowers now enable it to be described. It seems most allied to the Ceylon *A. zeylanicum*, Hook. f., of which fruiting examples only are known, but the

* In *Kew Bulletin*, 1921, p. 52 the ten New Orchids there described were inadvertently entitled "Decades XLVIII—XLIX" instead of *Decas* XLVIII.

different locality and slight differences in the vegetative organs warrant the belief that it is distinct. The petal-like character of the lip was remarkable, but was found in five flowers successively examined.

482. **Catasetum Rothschildii**, Rolfe; affinis *C. puro*, Nees, et *C. uncatum*, Rolfe, sed rostello dentibus duobus tenuibus divergentibus instructo distinguitur.

Pseudobulbi ovoideo-oblongi, circa 10 cm. longi. *Folia* oblongo-lanceolata, acuta, 3.8 dm. longa, 7.5 cm. lata. *Scapus* arcuatus; racemus 1.55 dm. longus, multiflorus; bracteae lanceolato-oblongae, acutae, 1-1.25 dm. longae; pedicelli 1.6-2 cm. longi. *Sepala et petala* subconniventia, elliptico-oblonga, subobtusa, concava, 2-2.4 cm. longa. *Labellum* superum, galeatum, late oblongum, obtusum, carnosum, 2 cm. longum, 1.4 cm. latum, apice incurvum, obtusum, integrum; os oblongum lateribus parallelis subincurvis minute crenulatis. *Columna* rostrata, 1.4 cm. longa; antennae parallelae, incurvae; rostellum cum dentibus 2 gracilibus divergentibus instructum.

Flowered in the collection of Sir Trevor Lawrence, Bart., Burford, Dorking, in February, 1899, having originally been obtained from the Hon. Walter Rothschild. It is allied to *C. purum*, Nees, and *C. uncatum*, Rolfe, but, among other characters, is readily distinguished by the rostellum possessing a pair of slender diverging teeth, in addition to the normal antennae. The flowers are light green, with the inside of the lip buff-yellow.

483. **Microstylis Whitmeei**, Rolfe; affinis *M. Reineckeanae*, Kränzl., sed floribus majoribus differt.

Caulis erectus, polyphyllus. *Folia* circa 9, breviter petiolata, ovato-elliptica, breviter acuminata, tri-quinquenervia, 5-7.5 cm. longa, 1.85-3.1 cm. lata; petiolus 2.5 cm. longus, basi vaginatus. *Scapus* 3 dm. longus, basi nudus; racemus multiflorus. *Bracteae* triangulari-lineares, acuminatissimae, 4-6 mm. longi. *Pedicelli* 3.75-5 cm. longi. *Sepala* oblonga, obtusa vel apiculata, 2-3 mm. longa. *Petala* lineari-oblonga, obtusa vel apiculata, 2-3 mm. longa. *Labellum* reniformi-orbiculare, 4.35 mm. latum, apice minute 4-5-dentatum; auriculae late rotundatae; callus subobsoletus. *Columna* brevissima; stelidia linearia.

SAMOA. Rev. S. J. Whitmee.

Allied to *M. Reineckeanae*, Kränzl., but having much larger flowers, those of the latter being described by Dr. Kränzl. as scarcely 1.5 mm. in diameter.

484. **Bulbophyllum scandens**, Rolfe; species insignis, a caeteris speciebus Africanis caule valido scandente tetragono epseudobulboso differt.

Caules scandentes, validi, tetragoni, radicanes circa 0.8-1 cm. lati, vaginis ovatis striatis imbricatis tecti, internodiis circa 1.5-2 cm. longis. *Pseudobulbi* obsoleti, diphylli. *Folia* elliptico-oblonga, subobtusa, subcoriacea, 15-17 cm. longa, 5-6 cm. lata. *Scapi* arcuati, circa 10 cm. longi; racemi multiflori. *Bracteae*

ovatae, apiculatae, circa 2 mm. longae. *Pedicelli* 5-6 mm. longi. *Sepala* oblonga, obtusa, circa 1 cm. longa. *Petala* laeviter arcuata, caeteris sepalis similia. *Labellum* recurvum, oblongum, obtusum vel emarginatum, circa 8 mm. longum; lobi laterales angusti, erecti. *Columna* clavata, 4 mm. longa.

SEYCHELLES ISLANDS. Common in forests of Mahé and the Silhouette, *Horne* 603; Cascade Estate, in mountain forests, 430 m. *Thomasset* 32; Casse les dents, *R. Dupont*.

Remarkable for its stout climbing 4-angled stems, and the absence of pseudobulbs. *Thomasset* remarks that it is found climbing rocks and trees, and that the flowers are cream-coloured or purple.

485. *Microstylis Thomassetii*, *Rolfe*; affinis *M. Rheedii*, *Lindl.*, differt foliis angustioribus, labelli dentibus duplo brevioribus.

Pseudobulbi anguste oblongi, 7-8 cm. longi, 2-3-phylli. *Folia* elliptico-ovata vel oblonga, acuta vel breviter acuminata, paulo undulata, basi attenuata, 12-15 cm. longa, 3-4 cm. lata. *Scapi* 20-30 cm. longi; racemi multiflori. *Bractaeae* lineari-lanceolatae, acuminatae, 4-8 mm. longae. *Pedicelli* 4 mm. longi. *Sepalum* ovatum vel ovato-oblongum, obtusum 2 mm. longum; lateralia lineari-oblonga, obtusa, subfalcata, 3 mm. longa. *Petala* linearia, obtusa, 3 mm. longa. *Labellum* flabellatum vel transverse oblongum, 3 mm. latum, apice breviter 8-9-dentatum, basi callo erecto bidentato instructum. *Columna* 1 mm. longa, alis minutis. *Capsula* obovoidea, breviter pedicellata, 8-10 mm. longa.

SEYCHELLES ISLANDS. Mahé; Cascade Estate, *H. P. Thomasset* 99. Endemic.

486. *Anoetochilus burmannicus*, *Rolfe*; affinis *A. sikkimensis*, *King & Pantl.*, sed labelli lobis angustioribus et multo longioribus differt.

Herba terrestris, circiter 20 cm. alti. *Rhizoma* repens. *Folia* 3-4, breviter petiolata, ovata, acuta, 4-5 cm. longa, 2.5-3 cm. lata; petiolus 1-1.5 cm. longus, basi ample vaginatus. *Scapus* erectus, circiter 12 cm. longus, omnino sparse pubescens, vaginis ovato-lanceolatis vestitus; racemus laxis, pauciflorus. *Bractaeae* ovato-lanceolatae, acuminatae, circiter 1 cm. longae. *Pedicelli* patentes, 1.5 cm. longi. *Flores* medio-cres. *Sepalum* posticum ovatum, subobtusum, 5 mm. longum; sepala lateralia oblique oblonga, subacuta, 7 mm. longa. *Petala* membranacea, late semiovata, subobtusata, membranacea, 5 mm. longa. *Labellum* 1.5 cm. longum, basi hastatum, apice divergente bilobum; lobi lineari-oblongi, subobtusati, 6 mm. longi; unguis 5 mm. longus, subinteger; calcar conicum, obtusum, 3.5 mm. longum. *Columna* lata, 3 mm. longa, facie bilamellata.

BURMA. Pegri: Kadat Reserve; 300 m., in evergreen forest, *C. G. Rogers*.

Readily separated from *A. sikkimensis*, *King & Pantl.*, by the much elongated lobes of the lip. A plant in the Calcutta

Herbarium collected in Burma by *S. Toppin*, n. 4412, is very similar and may represent the same species, though there are a few differences in the floral structure. More complete material is desired.

487. *Maxillaria insignis*, Rolfe; affinis *M. grandis*, Reichb. f., sed colore sepalorum petalorumque differt.

Pseudobulbi oblongi, compressi, circiter 9 cm. longi. *Folia* petiolata, elliptico-oblonga, subobtusata, circiter 30 cm. longa, 9 cm. lata; petiolus conduplicatus, circiter 12 cm. longus. *Pedunculi* 35 cm. longi, multivaginati; vaginae conduplicatae, oblongo-lanceolatae, acutae, subimbricatae, 3-6 cm. longae. *Bractae* conduplicatae, oblongo-lanceolatae, acutae, 5.5 cm. longae. *Pedicellus* 6 cm. longus. *Sepalum* posticum elliptico-ovatum, acutum, concavum, 4.5 cm. longum; sepala lateralialia oblique triangulari-ovata, acuta, 3 cm. lata, basi in mentum oblongum 3.5 cm. longum extensa. *Petala* anguste ovata, acuta, 3.5 cm. longa, 1.4 cm. lata. *Labellum* obovatum, 4 cm. longum, obscure trilobum; lobi laterales obtusi; lobus intermedius semiorbicularis, 1.7 cm. latus, crispo-undulatus et crenulatus; discus callo oblongo 1.4 cm. lato instructus. *Columna* crassa, 1.5 cm. longa.

PERU. Forget.

A very large and distinct species, which was introduced by Messrs. Sander & Sons, St. Albans, and flowered at the Royal Botanic Garden, Glasnevin, in May 1912. It is apparently allied to the Ecuadorean *M. grandis*, Reichb. f., which is known only from description, and of which no dimensions whatever are given, but as that is described as having the front-lobe of the lip oblong and the petals spotted the two are believed to be distinct. The sepals and petals of *M. insignis* are ivory white, the former slightly and the latter strongly striped with red-purple, while the lip is dull yellow, with some brown markings on the front lobe, a red brown suffusion and darker lines on the side lobes, and a deep yellow crest.

488. *Camaridium vinosum*, Rolfe; a *C. Laurenceano*, Rolfe, foliis duplo brevioribus et latioribus et floribus vinosis valde distincta.

Herba epiphytica, 15-30 cm. alta. *Caules* parce ramosi sub-compressi, 4-12 cm. longi, remote pseudobulbiferi. *Pseudobulbi* oblongi, compressi, 2-2.5 cm. longi, apice diphylli. *Folia* disticha, patentia, sessilia, oblonga, brevissima biloba, 1.5-2.3 cm. longa, 4-8 mm. lata, vaginis conduplicatis striatis imbricatis caule adpressis. *Flores* axillares, solitarii, pedunculati, vinosi. *Pedunculi* circiter 2 cm. longi, vaginis lanceolatis paucis vestiti. *Sepala* subconniventia, oblonga, subobtusata, vel apiculata, 0.8-1 cm. longa, lateralialia in mentum breve extensa. *Petala* oblonga, obtusa, vel apiculata, 7-9 mm. longa. *Labellum* late oblongum, obtusum, integrum vel obscure trilobum, 7-9 mm. longum; discus callo oblongo nitido ornatus. *Columna* 6-7 mm. longa.

Habitat. Not recorded.

This species flowered in the collection of the late Sir Trevor Lawrence, Bart., Burford, Dorking, in July, 1899.

489. *Cryptophoranthus Lehmannii*, Rolfe; a *C. Dayano*, Rolfe, floribus multo minoribus, sepalis lateralibus subtus minus concavis intus favoso-areolatis et maculatis differt.

Caules 5-6.3 cm. longi, vaginis amplis tubulosis obtecti. *Folia* petiolata, late elliptica vel suborbicularia, subobtusae, 6.3-7.5 cm. longa, 3.7-5.6 cm. lata; petiolus 1.6-1.8 cm. longus. *Flores* fasciculati, breviter pedunculati, 3.1 cm. longi. *Bracteae* spathaceo-ellipticae, apiculatae, 6-8 mm. longae. *Ovarium* hexapterum, alis undulatis. *Sepalum* posticum ellipticum, apiculatum, valde concavum, quinquecarinatum, carinis prope apicem paucis serrulatis; sepala lateralalia connata, elliptica, apiculata, subtus subconcava, intus favoso-areolata. *Fenestra* 1.6-1.8 cm. longa. *Petala* obliqua, late oblonga, apiculata, 3.5 mm. longa. *Labellum* sagittatum, 3.5 mm. longum; lobi laterales erecti, apice angusti reflexi; lobus intermedius oblongus, subobtusus, denticulatus; callus dentiformis, prope basim insertus. *Columna* oblonga, 2 mm. longa.

COLOMBIA. Popayan, *Lehmann*.

Flowered at the Glasnevin Botanic Garden in November 1899, and subsequently at the Zurich Botanic Garden, and in the collection of the Hon. Walter Rothschild. The sepals are heavily blotched with dull purple on a whitish ground, which becomes yellow towards the base of the lateral pair; and the petals and lip yellow, the former being more or less spotted with dull purple.

490. *Megaclinium angustum*, Rolfe; affinis *M. Millenii*, Rolfe, sed rhachi 2.5-4 mm. diametro, floribus purpureis fere concoloribus differt.

Pseudobulbi caespitosi, ovoideo-oblongi, obscure tetragoni, 1.25-2.5 cm. longi, diphylli. *Folia* lineari-oblonga, subobtusae, 3.75-4.4 cm. longa, 0.6-1.2 cm. lata. *Scapi* 3.75-5 cm. longi. Rhachis linearis, tenuis, minute lepidota, 2.5-4 mm. diametro, margine crenulato; bracteae late triangulares, subobtusae, 1.5 mm. longae, 1.5 mm. latae, demum recurvae; flores 2.5 mm. distantes; pedicelli 2 mm. longi, sparse pubescentes. *Sepalum* posticum lineari-oblongum, subacutum, 3.5 mm. longum; lateralalia ovata, concava, 2 mm. longa, supra medium reflexa, apice subfalcata, acuta. *Petala* subulata, falcata, 2 mm. longa. *Labellum* ovatum, obtusum, integrum, recurvum, vix 1 mm. longum. *Columna* brevis, alis brevissimis obtusis.

W. TROPICAL AFRICA. Old Calabar, *Holland*.

Sent to Kew in 1898 by Mr. J. H. Holland, Curator of the Botanic Garden, Old Calabar, and flowered in the Kew Collection in June 1900. The flowers are almost uniformly lurid purple in colour, a little paler on the dorsal sepal and petals.

VI.—DIAGNOSES AFRICANAE : LXXV.

1661. *Crotalaria Hislopii*, Corbishley [Papilionaceae-Genisteae]; affinis *C. anisophyllae*, Welw., sed foliis angustioribus longioribusque, sepalis latioribus differt.

Herba erecta, circiter 25 cm. alta, e basi ramosa. *Folia* simplicia, linearia, subtus strigoso-pubescentia, petiolo 5 mm. longo; stipulae subulato-lineares, 3-5 mm. longae, apice recurvatae. *Flores* pauci, rachibus strigoso-pubescentibus foliis longioribus. *Bracteae* lineares, recurvatae, 3-4 mm. longae; pedicelli circiter 5 mm. longi. *Calyx* ad 1.3 cm. longus, lobis acuminatis circiter 1 cm. longis utrinque minute strigillosis. *Corolla* glabra, calyce paullo longior; vexillum erectum, violaceum; carina et alae luteae. *Legumen* juvenile cinereo-oblongum, stipitatum, 2.5 cm. longum, 8 mm. latum, stylo persistente apice petala emarcida gerente.

TROPICAL AFRICA. Southern Rhodesia, probably Rusapi, *A. Hislop* 155.

1662. *Crotalaria Breyeri*, N. E. Brown [Papilionaceae-Genisteae]; affinis *C. eldomae*, Baker f., sed ramis gracilioribus et floribus multo minoribus conspicue differt.

Frutex glaber, ramis gracilibus. *Folia* trifoliolata; petioli 0.6-1.5 cm. longi, 0.5 mm. crassi; foliola 0.5-1.5 cm. longa, 1-4 mm. lata, linearia vel cuneato-oblongata, acuta vel obtusa. *Racemi* laterales, graciles, 3-7 cm. longi, laxe 2-4-flori; bracteae ad 2 mm. longae, subulatae; pedicelli 5-7 mm. longi. *Calyx* 6-7 mm. longus, campanulatus, ad medium subaequaliter 5-dentatus, dentibus deltoideis acutis. *Corolla* circa 2 cm. longa; vexillum suborbiculare; alae carina duplo breviores, obtusae, rugosae; carina acute rostrata.

SOUTH AFRICA. Transvaal: Griffin Mine in Pietersburg District, *Breyer* in Herb. F. A. Rogers 23998.

This shrub appears to be quite glabrous to the naked eye, but with a strong lens some very minute sparsely scattered and very closely adpressed hairs may be detected upon the young branchlets and leaves.

1663. *Erythrophleum lasianthum*, Corbishley [Caesalpiniaceae-Dimorphandreae]; affinis *E. Couminga*, Baill., et *E. pubistamineo*, Hennings, sed ab illo foliorum costa glabra, inflorescentia laxiore, pedicellis longioribus, filamentis dense lanatopilosis, ab hoc foliis glabris nitidis oblique ovatis apice angustatis, staminum pilis multo longioribus et densioribus differt.

Folia bipinnata, pinnis oppositis 12-15 cm. longis, rachibus teretibus glabris; foliola utrinsecus 5 vel 6, alterna, oblique ovata, apice emarginata, basi inaequalia rotundata, usque ad 4.5 cm. longa, 1.5-2 cm. lata, chartacea, marginibus leviter undulatis, utrinque glabra et nitida, subtus costa media conspicua, nervis lateralibus utrinsecus circiter 15; petioluli 4 mm.

longi, glabri, supra canaliculati. *Inflorescentia* paniculata, pedunculis lanato-pubescentibus demum glabrescentibus, pedicellis hirsutis usque ad 3 mm. longis. *Receptaculum* turbinatum, extra tomentosum, intra glabrum, circiter 2 mm. longum. *Sepala* oblonga, obtusa, circiter 2.5 mm. longa, extra tomentosa, marginibus dense pilosa. *Petala* oblanceolato-spathulata, apice rotundata, 4 mm. longa, 1 mm. lata, extra lanato-tomentosa. *Stamina* 10, cum petalis inserta; filamenta inaequalia, dense lanato-pilosa, circiter 5 mm. petalis longiora; antherae parvae, ovatae, dorso affixae. *Ovarium* stipitatum, circiter 7 mm. longum et 1 mm. latum, fusiforme, dense lanatum, in stylum brevissimum glabrum contractum. *Fructus* non visus.

SOUTH AFRICA. Natal: Ingwavuma, Nov. 1919, Magistrate of District, *National Herb. Pretoria* 1228.

1664. ***Pteronia Foleyi***, *Hutchinson et Phillips* (Compositae-Asteroidae), affinis *P. sordidae*, N.E.Br., sed foliis majoribus bracteis inferioribus minoribus numerosis minus membranaceis differt.

Frutex circiter 30 cm. altus. *Rami* glabri, brevissimi. *Folia* opposita, 5-6 mm. longa, 1.5 mm. lata, linearia, apice rotundata et frequenter recurva, minute papillosa. *Capitula* terminalia, solitaria, subsessilia, 2.5 cm. longa, obconica. *Involucri bractee* circiter 10 seriatae, minute ciliatae; extimae elliptico-lanceolatae, marginibus vix membranaceis; intimae oblanceolatae, apice obtusae. *Corollae tubus* 9 mm. longus, cylindricus, glaber; lobi 3 mm. longi, 1 mm. lati, oblongi, apice obtusi. *Filamenta* 2.5 mm. longa, linearia; antherae 5.5 mm. longae, lineares. *Pappus* 1 cm. longus, setis basi connatis, *Achaenia* 5.5 mm. longa, obovata, villosa; stylus 7 mm. longus, teres, glaber; lobi 4 mm. longi, lineares, apice angustati, obtusi.

SOUTH AFRICA. Wittebergen; Matjesfontein, *Rehmann* 2923; common on flats and stony Kopjes at Matjesfontein, October 1921, *W. J. Foley in S. Afr. National Herbarium* 1516.

Near *P. sordida*, N.E.Br. but differs by its larger leaves which are usually recurved, bracts much narrower and with less membranous margins, and usually less densely villous achenes.

1665. ***Acocanthera longiflora***, *Stapf* [Apocynaceae-Carisseae]; affinis *A. venenatae*, G. Don, sed floribus fructibusque omnibus partibus majoribus.

Arbuscula, 5-6 m. alta, glaberrima inflorescentiis exceptis; ramuli novelli magis minusve compressi, laeves. *Folia* elliptica vel elliptico-oblonga, apice mucronato-acuta, basi acuta vel subcuneata, plerumque 6-9 cm. longa, 3.5-4 cm. lata, rarius ampliora (ad 11 cm. longa, 6.5 cm. lata), coriacea, exsiccando olivaceo-viridia, subtus pallidiora, nitida, nervis secundariis utrinque 7-9, tertiariis similibus saepe interjectis, obliquis parallelis utrinque prominentibus, venis distinctis prominulis; petiolus crassiusculus, 2-3 mm. longus. *Inflorescentiae* subglomeruliformes, plerumque ubique puberulae, multiflorae, sessiles

vel subsessiles, axi demum ad 5 (raro 8) mm. longo; bracteae ovatae, acutae, minutae. *Calyx* puberulus, raro glaber, 3·5–4 mm. longus; sepala ovato-lanceolata vel lanceolata, subacuminata. *Corolla* alba, suaveolens; tubus circiter 15–16 cm. longus, magis minusve puberulus, intus laxe pilosus; lobi rotundato-ovati, breviter apiculati, 2–2·5 mm. longi. *Antherae* 1·5 mm. longae. *Stigma* breve, obtusum. *Bacca* oblongo-ellipsoidea, 2·3–2·5 cm. longa, medio 1·5–1·7 cm. diametro, demum atro-purpurea vel exsiccando nigra, edulis. *Semina* ambitu late elliptica, circiter 1·4 cm. longa, 1·1 cm. lata, albida. *A. venenata*, Vatke ex Schweinf. in Engl. Jahrb. xvii. Beibl. 41, 46 (footnote), Holmes in Pharm. Journ. ser. 3, xxiv, 42; Stapf in Dyer, Fl. Trop. Afr. iv. 94 (partly). *A. Schimperi*, Schweinf. in Boll. Soc. Afr. Italia x. (1891) xi–xii, 13 (the Taita plant); and in Engl. Jahrb. xvii. l.c., Pax in Engl. Pfl. Ost. Afr. B. 519 (the Taita plant). *A. abyssinica*, K. Schum. in Engl. Pfl. Ost. Afr. A. 48 (partly?).

EAST AFRICA. Kenya Colony; Taita, Ndara Mountains, 1270–1525 m., *Hildebrandt*; *Holmwood*. Nairobi, common on the edges and in open places of the forests, 1780 m., *C. F. Elliott* 266; *Battiscombe*; Kikuyu, *Whyte*. Usambarā; Kwa Mshuza, 1300 m., *Holst* 8968. “Deutsch-Ostafrika” without precise locality, *Busse*, 382.

A. venenata, G. Don, appears to be confined to South Africa and Matabeleland (by streams near Buluwayo, *Rand*, 572; Hope Fountain, south of Buluwayo, *Baines*).

According to Mr. Battiscombe the fruits are edible having a sweet taste and are readily devoured by birds. Mr. Battiscombe writes:—“Both *Acocanthera Schimperi* and *A. longiflora* are used indiscriminately for arrow-poison, but that derived from *A. Schimperi* is said to be more potent than *A. longiflora*; to the Wakamba natives who are chief users of the arrow poison both trees are known under the name of ‘Ki bai’ but *A. longiflora* is qualified as ‘Ki bai chi ao’ e.g. black Ki bai. Just now the former is in full blossom and is a beautiful sight.”

I have adopted Endlicher’s spelling of *Acocanthera* in the place of the absurd and barbarous form *Acokanthera*, found in G. Don’s *Generum Systema*, which is evidently due to a printer’s error. Don himself gives the derivation of the name as “from ακωκη, *acoce* (two ce’s) a mucrone.....” Another printer’s error of a similar nature has crept into the same paragraph lower down where the anglicized names of the species of *Acocanthera* are rendered as “Poisonous Aconanthera,” “Lamarck’s Aconanthera,” etc. and there are further misprints on the same page, a clear proof of bad reading. Pfeifer, *Nomenclator Botanicus*, has also *Acocanthera*.

1666. *Brachystelma brevipedicellatum*, *Turrill* [Asclepiadaceae-Ceropegieae]; affinis *B. Arnotii*, Baker, sed pedicellis brevioribus floribus majoribus corolla haud reflexa coronae lobis truncatis in parte superiore atropurpureis praecipue differt.

Tuber napiforme, 5 cm. diametro, pallide brunneum. *Caules* 2-4, erecti, a basi saepe ramosi, minute puberuli pilis plus minusve reflexis. *Folia* elliptica vel lanceolato-elliptica, apice obtusa vel subacuta, basi in petiolum circiter 5 mm. longum angustata, 2 cm. longa (petiolo escluso), marginibus leviter undulata, in pagina superiore margines versus hispidula, in pagina inferiore omnino hispidula pilis uncinatis instructa, nervis subtus prominentibus, supra impressis, nervis lateralibus utrinque 5-6 vix anastomosantibus. *Flores* in foliorum axillis 3-5; pedicelli 2 mm. longi. *Sepala* lanceolata, acuta, 3 mm. longa, 1 mm. lata, puberula. *Corolla* extus fere glabra, viridis, tubo breviter campanulato, lobis patulis supra atropurpureis leviter corrugatis subcarnosis pilis brevibus nitentibus instructis. *Corona exterior* nulla. *Corona interior* lobis 5 staminis oppositis truncatis vix 2 mm. latis ex ore corollae tubi eminentibus parte superiore atropurpureis intus pulvinis carnosus viridibus staminis adnatis praedita. *Stamina* flava, brevia, inflexa. *Styli apex* truncatus.

SOUTH AFRICA. Described from a plant cultivated at Kew and received originally from Pretoria.

1667. **Huernia Hislopii**, Turrill [Asclepiadaceae-Stapelieae]; affinis *H. barbatae*, Haw., sed corollae lobis reflexis, tubo haud intus pilis longis instructo, coronae exterioris lobis angustioribus praecipue distinguitur.

Planta a basi ramosa, circiter 5 cm. alta, ramis 5-angulatis inferne viridibus superne purpurascentibus glaucis glabris 1 cm. diametro ad angulos dentibus 3 mm. longis instructis. *Flores* solitarii; pedicellus 6 mm. longus, glaber. *Sepala* lanceolato-subulata, apice acuminata, 6 mm. longa, glabra. *Corolla* campanulata; tubus 1.6 cm. longus, inferne leviter ampliatus, superne contractus, extra albus, intra lineis atro-sanguineis instructus, fauce 1.1 cm. diametro, papillis subclavatis albis apice fusco-sanguineis praeditus; limbus 5-lobatus, cremeus, maculis fusco-sanguineis numerosis instructus, lobis deltoideis acuminatis 1.4 cm. longis papillosis valde reflexis, dentibus intermediis 3 mm. longis basi 2 mm. latis reflexis. *Corona exterior* lobis 5 oblongis 4 mm. longis 3 mm. latis atro-sanguineis et fere nigris apice truncatis breviter 3-4-dentatis praedita. *Corona interior* lobis 5 subulatis 4 mm. longis ad medium conniventibus superne divergentibus albis apice atro-sanguineis instructa.

TROPICAL AFRICA: Rhodesia, *Hislop*. Described from a living specimen grown in the Royal Botanic Gardens, Kew.

1668. **Bowkeria citrina**, Thode [Scrophulariaceae-Cheloneae], affinis *B. velutinae*, Harv. ex Hiern, sed foliis aureo-glandulosis parce puberulis minime vero velutinis, pedunculis brevioribus, calycis segmentis angustioribus lanceolatis-oblongis acutis vel acuminatis, corolla citrina distincta.

Frutex ramosissimus, 6-8-pedalis, fragrans. *Ramuli* subteretes, pubescentes glandulosique, internodiis foliis multo bre-

vioribus. *Folia* terna, breviter petiolata, lanceolata, 5–7.5 cm. longa, medio 0.6–1 cm. lata, acuta, basi et apice angustata, marginibus integris vel sub apice denticulatis subrevolutis, utrinque aureo-glandulosa glandulis subtus multo magis conspicuis, superne densius subtus parce puberula vel praeter nervos subglabra, hic pallidiora et tenuiter reticulata. *Petioles* 2–3 mm. longi, puberuli. *Pedunculi* axillares, oppositi, uniflori, puberuli, 1–1.2 cm. longi, sub apicem bibracteolati. *Bracteolae* lanceolatae, puberulae, 4–5 mm. longae. *Calyx* alte 5-partitus, segmentis oblongo-lanceolatis acuminatis ciliolatis. *Corolla* bilabiata, obliqua, ventricosa, inflata, puberula, flava, interne purpureo-punctata, ad 1.6 cm. longa, labio superiore bidentato, inferiore tridentato lobis brevibus obtusis ciliolatis. *Stamina* filamentis arcuatis glabris, antheris didymis glabris reniformibus. *Ovarium* pubescens. *Stylus* filiformis, puberulus, longe persistens. *Capsula* septicidalis, bivalvis, aureo-glandulosa, ad 1 cm. longa. *Semina* ignota.

SOUTH AFRICA. Natal: Utrecht Division; by the tributary streamlets of the Pongola River, near Rooipoort, 1270 m., *J. Thode*.

An agreeably scented large shrub growing by the banks of streamlets under the Drakensberg in the Utrecht division and flowering from January to June.

1669. *Acrocephalus erectifolius*, *N. E. Brown* [Labiatae-Ocimoideae]; persimilis *A. venoso*, Baker, sed foliis brevissime petiolatis bracteisque subduplo majoribus et late membranaceo-marginatis facile distinguitur.

Herba perennis, erecta, ad 80 cm. alta. *Caules* 2–4 mm. crassi, patule pilosi. *Folia* erecta, utrinque pilosa; petioli 2–3 mm. longi; laminae 5–9 cm. longae, 0.5–1.2 cm. latae, lineari-lanceolatae, acutae, sub-integrae vel minute denticulatae. *Capitula* globosa, circa 1 cm. diametro, corymboso-paniculata, foliis reductis coloratis praedita; bracteae 4–5 mm. longae, 5–8 mm. latae, late rhomboideae, subacutae, late colorato-marginatae, ciliatae et infra marginem dorso pubescentes. *Calyx* 2 mm. longus, obtuse bilabiatus. *Corolla* 5 mm. longa, lobis parvis obtusis.

TROPICAL AFRICA. North-west Rhodesia; Broken Hill, on clay soil, 1220 m. June 1909, *F. A. Rogers* 8157.

1670. *Englerastrum rhodesianum*, *N. E. Brown* [Labiatae-Ocimoideae]; affinis *E. Schweinfurthii*, Briq., sed racemis duplo longioribus et ramosis conspicue differt.

Herba annua, 1.5–40 cm. alta, erecta. *Caulis* 1.5–4 mm. crassus, simplex vel oppositely ramosus, pubescens vel puberulus, fere ad basin florifer, internodiis 2–5 cm. longis. *Folia* opposita, deflexa, subsessilia, 1.5–2.5 cm. longa, 1–1.5 cm. lata, ovata, obtuse acuta, basi rotundata vel subcuneata, subintegra vel obscure crenata, utrinque parce pubescentia. *Racemi* patuli, 5–15 cm. longi, laxely ramosi, graciles, minute puberuli vel fere glabri;

ramuli distantes, ad 3 cm. longi, apice subcapitato-3-6-flori; pedicelli 1-2 mm. longi. *Calyx* 1.5 (fructu 2.5) mm. longus, subaequaliter 5-dentatus, pubescens, dentibus deltoideis acutis. *Corolla* 4 mm. longa, caerulea; labium superum 1 mm. longum, inaequaliter 4-lobum; labium inferum 2 mm. longum, concavum.

TROPICAL AFRICA. Northern Rhodesia: Mumbwai, *Mrs. Macaulay* 637; Livingstone, *F. A. Rogers* 7205.

VII.—MISCELLANEOUS NOTES.

MR. H. GREEN, Assistant Superintendent of the Botanical and Forestry Department, Hong Kong (*K.B.*, 1911, 118) has been appointed by the Secretary of State for the Colonies Superintendent of the Department in succession to the late Mr. W. J. Tutchet (*K. B.*, 1920, 136).

MR. L. G. RICHARDS, a member of the gardening staff of the Royal Botanic Gardens, Kew, has been appointed by the Secretary of State for India, on the recommendation of Kew, a Probationer Gardener in India.

Visitors during 1921.—The number of visitors to the Gardens in 1921 was 1,236,308.

Additions to Gardens, 1921.—The number of separate consignments of living plants, seeds, etc., to the Gardens was 338. The most important were the following:—

Edinburgh, Royal Botanic Garden.—147 packets of seeds; *Bursera pinnata* and *B. Delpechiana*, *Rhododendron acuminatum*; various other plants and seeds.

Glasnevin, Royal Botanic Garden.—39 packets of seeds; *Lilium Lowii*, *Protea abyssinica*, *Primula Fortunei*, *Bulbophyllum erythrostachyum*.

Cambridge Botanic Garden.—Various herbaceous plants and seeds.

R.H.S. Gardens, Wisley.—*Lilium giganteum*, Chinese shrubs and herbaceous plants.

Regents Park (T. Hay, Superintendent).—14 large Agaves, *Musa Ensete*. *Restio subverticillatus*.

Dominica Botanic Garden.—Seeds *Phytelephas macrocarpa*.

St. Kitts-Nevis Agri. Dept.—*Melocactus communis*.

Nigeria Agri, Dept.—Seeds of economic plants, bulbs, *Crinum purpurascens*, *Lissochilus Heudelotii*.

Rotterdam Botanic Garden.—*Macodes petola*.

Batoum Botanic Garden.—Seeds of herbaceous plants and Palms.

- Gold Coast Agri. Dept.—Seeds *Digitarum exilis*.
 Soudan Forestry Dept.—Orchids, Ferns, etc.
 Ceylon, Royal Botanic Garden.—*Dendrobium aureum*.
 U.S. Dept. of Agriculture.—Seeds *Prunus Davidiana*, etc.,
Casimiroa edulis, *Pinus Bungeana*.
 Tokyo Botanic Garden.—106 packets of seeds.
 Kirstenbosch Botanic Garden.—S. African bulbs, seeds of
Proteas, etc.
 S. African Dept. of Agriculture, Pretoria.—*Aloe sessiliflora*,
 seeds *Osyris abyssinica*.
 Seychelles Botanic Station.—Seeds of *Lodoicea sechellarum*.
 Mauritius Forest Dept.—Wardian case of Orchids and other
 plants. Seeds *Typhonodorum Lindleyanum*, various Palms and
 Pandanads.
 Penang Botanic Garden.—Seeds *Pholidocarpus macrocarpa*
 and *Borassus machadonis*.
 Arnold Arboretum.—Many packets of seeds, including *Quercus*
rhombica; collection of seeds from Mr. Hers, Peking.
 Uganda, Dept of Agriculture.—Seeds *Encephalartos Laurentianus*.
 Singapore Botanic Garden.—Four Wardian cases of plants.
 Seeds *Hosea Lobbi*.
 Sydney Botanic Garden.—Seeds *Telopea speciosissima*.
 Darwin Botanic Garden.—Seeds *Callitris intratropica*.
 Egyptian Ministry of Agriculture.—Various seeds.
 Kumaon Botanic Garden.—Seeds and roots of native plants
 including *Habenaria Suzannae*.
 Angola Botanic Garden.—Various seeds.
 Ottawa Experimental Farm.—Seeds *Zizania aquatica*.
 Uganda Botanic Garden.—Orchids.
 Kenya Colony, Forest Dept.—Various seeds.
 Messrs. Sanders, St. Albans.—*Vanda luzonica*.
 Messrs. Charlesworth & Co., Haywards Heath.—*Eulophiella*
Rolfei and other Orchids.
 Mr C. Engelmann, Saffron Walden.—Collection of Carnations.
 Messrs Wallace & Co., Tonbridge.—Liliums and *Clematis*
koreana.
 Messrs Vilmorin Andrieux & Co., Verrières.—Seeds of Chinese
 trees and shrubs.
 Mr T. Richardson, Victoria, Australia.—Collection of Aus-
 tralian seeds.
 Mr J. C. Watt, Aberdeen.—*Lonicera splendida*.
 Mr J. S. Gamble, Liss.—*Arundinaria Pantlingii* and *A. Maling*.
 Mr H. J. Elwes, Colesborne.—Various seeds and plants.
Hedychium Elwesii, *Cymbidium Devonianum*, *Campanula mira-*
bilis, etc.
 Mr A. Pride, Lincoln.—*Stevia Rebaudiana*, *Hippeastrums*, etc.
 Mr R. Fox, Penjerrick.—*Rhododendrons*.
 Mrs King, Hendon.—Collection of Indian seeds.
 Mr W. R. Price, Chepstow.—Orchids from Formosa.

Mr C. B. Kloss, Richmond.—*Amorphophallus Rex*, bulbs, seeds of *Hodgsonia heteroclita*.

Mr A. E. Bowles, Waltham Cross.—Various spp. of *Crocus*.

Booth Steamship Co., Liverpool.—Seeds *Attalea funifera*.

Mr R. B. Stamford, Loughborough.—Large plant of *Euphyllum truncatum*.

Mr A. M. Mitford, Upton Park.—Various tropical plants and seeds.

Mount Everest Committee of R. Geog. Soc. and Alpine Club.—Collection of seeds (Everest Expedition).

Mr J. C. Williams, Caerhays.—*Populus Wilsoni*, *Daphne retusa*, Chinese *Rhododendrons*.

Mr R. S. Hall, Blackpool.—Dwarf *Musa* from West Africa.

Mr J. Kay, Prestwick.—Seeds of conifers.

Marquis of Headfort, Meath.—Hardy trees and shrubs.

Mr A. K. Bulley, Neston.—Seeds *Eriogonum Wrightii*, *Codonopsis Bulleyana*.

Mr H. Spence, Knutsford.—Seeds *Quercus cornea*.

Mr M. Yorke, Iver Heath.—*Rhododendron Edgarianum*.

Mr P. D. Williams, St Keverne.—Hardy trees and shrubs, *Rhododendron Boothii*: seeds *Quercus marylandica*.

Mr R. Cory, Duffryn.—Chinese seeds, trees and shrubs.

The Hon. Vicary Gibbs, Aldenham.—*Cotoneaster Vicarii*, *Syringa palibiniana*.

Major A. A. Dorrien Smith, Tresco—Various seeds and plants.

Major L. de Rothschild, Gunnersbury.—Chinese seeds, hardy *Nymphaeas*, *Arundinaria rubicunda*, *Magnolia Wilsoni*.

Major A. Pam, Broxbourne.—*Hymenocallis Amancaes*.

Mr C. Turner, Slough.—*Syringa Swezingowii*.

Mr S. T. Dunn, Kew.—Seeds *Cinnamomum inunctum*.

Mr J. Cadman, R. Colonial Institute.—Seeds *Hodgsonia*, *Theobroma* and *Acrocomia*.

Dr H. Durham, Hereford.—*Polymnia edulis*, *Iris atrofusca*.

Mr A. Grove, Henley.—*Lilium auratum macranthum*.

Mr C. W. James, Welbeck Street, W.—Seeds *Quercus alnifolia*.

Mr T. H. Lowinsky, Sunningdale.—*Rhododendrons*.

Mr H. G. Elisha, Canonbury.—Collection of *Mesembryanthemums* and other succulents.

Mr G. Fraser, Uclulet.—Hybrid *Rubi*, *Erythroniums*.

Mr D. Tannock, Dunedin.—Seeds of *Celmisias*, etc. Wardian case of plants.

Lt. Col. Lee, S. Shan States.—Seeds *Aristolochia Hookeriana*.

Mr C. Hanbury, La Mortola.—Collection of seeds.

Mr W. Purdum (the late), Peking.—Seeds of Chinese plants.

Mr F. Griffith, Bloemfontein.—Seeds, *Cupressus arizonica* and of S. African Heaths.

Miss Wilman, Kimberley.—Various bulbs and seeds.

Mr G. Coomber, Zomba.—Seeds *Widdringtonia Whytei*, *Khaya senegalensis*.

Mr M. T. Dawe.—Various seeds from the Gambia. Tubers of Yams, *Arracacha esculenta*, *Solanum* sp., fruit edible. Orchids, bulbs and seeds from the Congo. Seeds *Befaria* sp.

Miss M. Mason, Cape Town.—Seeds, bulbs and tubers of S. African plants.

Mr T. B. McLelland, Porto Rico.—*Dioscorea esculenta*.

Mr E. C. Villiers, Ceylon.—Wardian case of plants.

Mr A. W. Maynard, Queenstown, S. Africa.—*Encephalartos horridus*, *E. Frederici-Guilielmi* and *E. sp.*

Mr G. W. Grabham, Khartoum.—Orchids, Ferns, bulbs and seeds.

Mr J. G. Watson, Johore.—Orchids.

Mr F. Kingdon Ward.—Many packets of seeds, collected in China.

Mr G. M. Michell, Para.—Collection of Passifloras.

Mr J. M. Hunter, Queensland.—*Nymphaea* sp. (native).

Mr W. Campbell, Johannesburg.—Seeds *Bolusanthus speciosus*.

Dr L. Cockayne, New Zealand.—Collection of seeds and native plants.

Mr C. H. Lankester, Uganda.—Orchids; seeds from Mount Elgon.

Mr M. Koch, W. Australia.—Collection of seeds.

Rev. H. H. Mathias, Christchurch, N.Z.—Seeds of New Zealand plants.

Mr P. M. Bayne, Chang-Tu, China.—Collection of Chinese seeds.

Mr A. F. Baker, Bloemfontein.—S. African bulbs and seeds.

Dr Y. S. Sanitwongse, Bangkok.—*Jasminum Rex*.

Mr T. D. A. Cockerell, Colorado.—Seeds *Primula Parryi*.

Mr T. P. Stokoe, Cape Town.—Seeds *Orothamnus Zeyheri*, *Erica*, etc.

Prof. Trabut, Algiers.—*Urginea maritima*.

Dr J. Borg, Malta.—*Urginea maritima*.

Mr L. H. Wah, Burma.—*Dendrobiums*.

Dr H. Takeda, Tokyo.—*Ranzania japonica*.

Mr C. Hummel, British Honduras.—*Ananas macrodontes*.

Surplus plants from the various collections were distributed as usual, either in exchange with botanic gardens, nurserymen, etc., or as gifts to teaching institutions. The total number of packets of seeds distributed was 2,888 of hardy trees and shrubs, and 3,090 of hardy herbaceous plants. The most important of the seeds obtained for special distribution were *Typhonodorum Lindleyanum*, *Pinus canariensis* and Nigerian Oil Palm. Two trees which have been freely distributed are the hybrid *Populus generosa* (cuttings) and *Aesculus indica*, the latter having seeded freely at Kew.

Wardian cases of plants were sent to the Botanic Gardens of Sierra Leone, Kumaon, Ceylon and the Emir of Katsina.

The recipients of plants, etc., from Kew, included the following :—

Richmond Park.—Trees and shrubs.

Armstrong College, Newcastle-on-Tyne.—Collection of Willows.

Mr A. Anesworth, Otford.—Shrubs and herbaceous plants.

Oxford Botanic Garden.—Collection Bamboos and collection of Selaginellas.

Mr C. Eley, East Bergholt.—Rhododendrons and other shrubs.

Mr A. Ashridge, Pinner.—Collection of hardy herbaceous plants.

Mr H. A. Hesse, Weener, Hanover.—Collection of seeds of trees and shrubs.

Ministry of Agriculture and Fisheries, Pathological Laboratory, Harpenden.—Hardy trees and shrubs.

Miss Willmott, Warley.—Hardy trees, shrubs and herbaceous plants.

Dr F. Boergesen, Copenhagen.—Rhododendrons and other shrubs.

Glasnevin, Royal Botanic Garden.—Collection of Mesembryanthemums, various greenhouse plants, trees and shrubs.

Mr H. J. Elwes, Colesborne.—Cacti, Mesembryanthemums and other plants.

Mr C. Hanbury, La Mortola.—Shrubs and herbaceous plants (tender).

Royal Botanic Society, Regents Park.—250 greenhouse plants.

Mr J. C. Williams, Caerhays.—Hardy trees and shrubs.

Emir of Katsina.—Plants and seeds.

Imperial War Graves Commission, St Omer.—Plants and cuttings of shrubs, various seeds.

Rachel Macmillan Training Centre, Deptford.—171 trees and shrubs.

Hyde Park.—50 *Aesculus indica*, 12 *A. californica*.

Regents Park.—80 trees and shrubs.

Ministry of Agriculture and Fisheries, Veterinary Laboratory, Weybridge.—50 shrubs.

Forestry Commission.—1,300 cuttings of *Populus generosa*, etc.

John Innes Horticultural Institute, Merton.—Shrubs and herbaceous plants.

National Physical Laboratory, Bushey Park.—384 trees and shrubs.

Jardin des Plantes, Paris.—50 trees and shrubs, collection of cuttings.

Mr. T. H. Lowinsky, Sunningdale.—Rhododendrons.

Included in the painting of the plant houses, etc., were the interiors of the central portion of the Palm House and the octagons of the Temperate House. The roof of the Victoria House and adjoining porch, owing to the decay of some of the

principal rafters, underwent considerable repair. Improved accommodation for the smaller succulent plants was provided by converting a large span frame into a low house, and this has given satisfactory results. Such a house was necessary owing to the purchase of a valuable collection of Mesembryanthemums formed by the late Mr H. G. Elisha, Canonbury. Other purchases of importance were a collection of Australian seeds from Mr T. Richardson, Elmhurst, Victoria, and greenhouse plants from Messrs Haage and Schmidt, Erfurt.

A new Lecture room for the use of the Student Gardeners has been fitted up and is now in use, so that it is possible for two courses of lectures to be given simultaneously.

Arboretum.—The most laborious undertaking in this Department has been the removal of mud from the Lake bottom. The last time it was done was during the winter of 1906–1907 (see *K.B.* 1907, p. 101), so that there has been a fifteen years' accumulation; this varied in depth in different parts of the Lake from four to eighteen inches. Sixteen of the regular labour staff were set to work in November, their places in the ordinary gang being taken by the same number of unemployed men in the neighbourhood. Owing to fine open weather, the work has proceeded very satisfactorily and will probably be finished early in February.

The Natural Order *Hamamelidaceae* or witch-hazel family, although small, is a very interesting one and the species in cultivation have been considerably increased by recent exploration in China. Two new genera have been made, *Sinowilsonia* and *Fortunearia*, both commemorating famous plant collectors in China. To provide adequate accommodation for these new introductions a miscellaneous shrubbery immediately north-east of King William's Temple was cleared away last February and the site devoted to the witch-hazels and their allies, of which the following is a complete list now in cultivation in the open air at Kew :—

<i>Corylopsis Gotoana</i> , Mak.	<i>Corylopsis Willmottii</i> ae, Rehd.
„ <i>Griffithii</i> , Hemsley.	„ & Wils.
„ <i>pauciflora</i> , Sieb. & Zucc.	„ sp. Forrest, 13516.
„ <i>platypetala</i> , Rehd. & Wils.	<i>Disanthus cercidifolia</i> , Maxim.
„ <i>sinensis</i> , Hemsley.	<i>Distylium racemosum</i> , Sieb. & Zucc.
„ <i>spicata</i> , Sieb. & Zucc.	<i>Fortunearia sinensis</i> , Rehd. & Wils.
„ „ var. <i>foliis variegatis</i> , Hort.	<i>Fothergilla Gardenii</i> , Murray.
„ <i>Veitchiana</i> , Bean.	„ <i>major</i> , Lodd.
	„ <i>monticola</i> , Ashe.
	<i>Hamamelis arborea</i> , Masters.

<i>Hamamelis japonica</i> , Sieb.	&	<i>Liquidambar formosana</i> , Hance.
	Zucc.	var.
" "	var. <i>rubra</i> ,	" <i>monticola</i> ,
	Hort.	Rehd. & Wils.
" "	var. <i>Zuc-</i>	" <i>orientalis</i> , Mill.
	<i>cariniana</i> ,	" <i>styraciflua</i> , L.
	Nichols.	<i>Parrotia Jacquemontiana</i> , Decne.
" <i>mollis</i> , Oliver.	"	<i>persica</i> , C. A. Meyer.
" <i>vernalis</i> , Sargent.		<i>Sinowilsonia Henryi</i> , Hemsley.
" <i>virginiana</i> , L.		<i>Sycopsis sinensis</i> , Oliver.

Loropetalum chinense, Oliver, has several times been tried in the open air, but is not hardy and is now grown in the Temperate House. *Eucommia ulmoides*, Oliver, and *Cercidiphyllum japonicum*, Sieb. & Zucc. are sometimes placed in *Hamamelidaceae*. Both are hardy.

The Rose Garden near the Pagoda, which is largely planted with the free-growing hybrids of the polyantha and Wichuraiana groups of roses, was formed out of a disused gravel pit in 1895-1896. The steep banks were held up by tree stumps. Many of these having decayed the whole garden was given a thorough overhauling during the early part of the winter, the decayed stumps being replaced by fresh ones. The opportunity was taken also to plant a large number of young roses in place of old worn-out ones.

The large breadths of spring flowering heaths which make such a charming feature at Kew suffered very badly from last year's drought; many were killed outright and many more so debilitated as to be unfit to remain. Fortunately there was a large quantity of healthy young plants in the nursery to take their place. The occasion of replanting was taken to make a winding informal grass walk through the heath bed close to the Unicorn Gate (H and I 9 on Key Plan) in which some interesting Magnolias and other rare shrubs are planted and will thereby be made available for closer inspection by visitors.

A considerable number of men have been employed since October in renewing the turf at the edges of the walks. Owing to public traffic this is an annual task, but the drought of 1921 has made it a much more arduous one than usual. The work nevertheless is essential, for worn and battered verges to the walks detract much from the appearance of any garden, however well kept in other respects.

The remainder of the Palace Lawn on which potatoes had been grown in 1920 was sown with grass seed last spring; and the western corner of Kew Green in front of the Herbarium which had been cut up into vegetable allotments during the war was also laid down to grass again.

Museums.—During the year the Staff has been fully occupied in dealing with a large number of products received for determination, and report and in furnishing information to commercial firms planters and others upon various plants of economic interest. The remainder of the timbers received in the rough from the Empire Timber Exhibition have been prepared for exhibit and placed in position and a large and miscellaneous collection of products obtained from the Rubber and other Tropical Products Exhibition have likewise been dealt with. Duplicates have been distributed to the Agent-General for Queensland, the National Museum Cardiff, School of Forestry at Yale University etc. As in past years a collection chiefly of duplicate material was prepared for the Bath and West and Southern Counties Show at Bristol also for the Shropshire and West Midland Agricultural Society at Shrewsbury and for the Royal Agricultural Society of England at Derby. The checking and relabelling of the contents of Museum No. I. has been completed and other necessary work on the permanent collections taken in hand. Individual students and parties from schools have made good use of the Museums during the year.

J. M. H.

Research in Jodrell Laboratory in 1921.—Mr. W. N. C. Belgrave studied the laticiferous tissue of certain rubber-plants, and investigated one or two cases of incipient “brown-bast” disease.

Mr. L. A. Boodle examined the structure of specimens from Lime-trees showing swellings due to Mistletoe, and compared the anatomy of camphor-yielding and oil-producing examples of *Cinnamomum Camphora*.

Dr. J. W. Munro and Mr. R. N. Chrystal carried out experiments on the fumigation of plants with hydrocyanic acid gas with a view to controlling insect pests.

Mr. W. B. Turrill made determinations of the chloride content of a number of samples of Thames water and of the water-supply of Kew Gardens, in connection with injuries to plants by salt.

Prof. F. E. Weiss made some further observations on graft-hybrids.

Presentations to the Library during 1921.—A presentation of great value and interest has been made to the library by Sir William T. Thiselton-Dyer. It consists of a collection of 201 original letters written to him by Sir J. D. Hooker, the first in April, 1870, and the last in December, 1909, thus covering a period of forty years. They will be prized because, as Sir William has remarked in a letter accompanying his gift, of the intimate picture they give of Sir Joseph himself; “his straight and unflinching fervour in the interests of science, and his extreme modesty.” Sir Joseph’s last letter in this collection is perhaps

the most interesting of all, for in it he records his personal recollections of Robert Brown. We are familiar with the estimate of Brown as a botanist, "botanicorum facile princeps," as expressed by Humboldt. Sir Joseph reveals some of his remarkable characteristics as a man. "Of all the friends I ever had," he wrote, "he was the most persistently reticent, whether in conversation or correspondence." Asa Gray (*Letters*, vol. i. p. 128) seems to have held the same opinion of Brown: "He is, as old Menzies told us, the driest pump imaginable." Though Brown showed him kindness during his preparations for the voyage to the Antarctic Sir Joseph makes the startling confession: "On my return he never asked me a single question about the Erebus, its captain or officers, or the places we had visited." This appears the more extraordinary in view of the fact that, as naturalist to Flinders' Expedition, Brown, about forty years before, had explored and collected in Tasmania, the scene of many important investigations by Hooker. Their impressions of the island and its people, and their common interest in its vegetation, might be supposed to have prompted many a question and remark when the two men met on Hooker's return, but Brown maintained a sphinx-like silence with regard to his own experiences and manifested no desire to learn anything of Hooker's. We should imagine from the singular treatment that Hooker received from Brown that the latter, in spite of so much that was really great and amiable in his character, was small enough to regard the enthusiastic younger botanist with some jealousy. Darwin (*Letters*, i. p. 73) observed that Brown was "strangely jealous on some points."

The late Lady Hooker has presented a large collection of typed matter comprising copies of Sir Joseph's letters, journals and lectures, etc.; also 37 original notebooks of his Indian and other travels.

Among manuscripts received from Dr. W. Botting Hemsley are his notes for a *Flora Seychellensis* and for a supplement to the *Biologia Centrali-Americana*, and numerous letters written to him by Sir J. D. Hooker; Dr. Hemsley has also presented some publications containing plates for the collection of drawings.

Mr. J. F. Duthie has presented 122 letters, also by Sir J. D. Hooker, written during the period 1875 to 1910. Three copies of Mr. Duthie's *Flora of the Upper Gangetic Plain*, etc., vol. iii. pt. 2, have reached the library from the Director of the Botanical Survey of India. This part includes the families Coniferae to Juncaceae.

In addition to the current issues of several serials and periodicals, received in exchange for Hooker's *Icones Plantarum*, the Bentham Trustees have presented a rare little volume by Baptista Fiera, which is sometimes quoted under the title: *Coena: de cibariorum virtutibus*; it is undated, but it is believed that it was published in Rome about 1489. It is an octavo volume containing 29 leaves of text, which consists of Latin

verses dealing with the properties of various foods, many of which are of vegetable origin. The work is dedicated to Cardinal Rarius, and the recto of the first printed leaf bears 16 lines by Pomponius Laetus (1425-1498), the Italian humanist, celebrated in his day as a teacher, and regarded as the first head of a philological school.

Dr. N. L. Britton has sent the four parts issued during the year of the *North American Flora*; and an interesting collection of 26 photographic postcards of views in the New York Botanical Garden has been received from Mrs. Britton.

Mr. J. H. Maiden has continued to present the parts as issued of his great work: *A critical revision of the genus Eucalyptus*; no less than 6 parts (44-49) were received from him in 1921, in addition to pamphlets. Parts 65-68 of Mr. Maiden's *Forest Flora of New South Wales* have been presented by the Honourable the Secretary of Agriculture, Sydney.

Prof. Hans Schinz has sent 3 more dissertations. They are; *Pflanzengeographische Beobachtungen auf einigen schweizerischen Hochmooren*, etc., by G. Josephy; *Pflanzengeographische Studien im Obertoggenburg*, by M. Vogt; and *De l'existence de variétés hétéroplôides de l'Hyacinthus orientalis L. dans les cultures hollandaises*, by W. E. De Mol.

From the Secretary of State for India have been received *The Silviculture of Indian Trees*, by R. S. Troup, a fine work in 3 volumes, *The English Factories in India, 1655-1660*, by W. Foster, *Report of the Indian Cotton Committee, 1919*, *The Botany of Bihar and Orissa*, by H. H. Haines, part 2, and *The Flora of the Presidency of Madras*, by J. S. Gamble, part 4. A second copy of the last named has been presented by Mr. Gamble.

The Delegates of the Press, Oxford, have presented 11 bound copies of the fifth supplement to the *Index Kewensis*, published in August last, and a copy of supplements 1-5, bound together, forming vol. iii. of the work.

Lieut.-Col. Sir David Prain's presentations include *Travaux du Laboratoire de Matière médicale de la Faculté de Pharmacie de Paris*, tome xii., and the continuation of the *Berichte der Deutschen Botanischen Gesellschaft* and of the *Bulletin de la Société de Botanique de France*. Mr. W. J. Bean has presented gardening books by S. Mottet, W. Robinson and J. Weathers. A copy of Mr. Robinson's *Home landscapes*, ed. 2, was presented by the author.

Prof. A. Engler has sent *Beiträge zur Flora von Afrika*, xxxvii.-xlvi., reprinted from his *Botanische Jahrbücher*, and Prof. F. Fedde vols. iii.-xiii. of his *Repertorium Specierum novarum*.

The library has received as in other years numerous publications from botanical, agricultural and other public institutions in the British Colonies and Dominions, in India, and in foreign countries, not already mentioned in this note. The Department

of Agriculture, Buitenzorg, the Agricultural and Forestry Departments, and the Bureau of Science in the Philippine Islands, the Agricultural Research Institute, Pusa, the Division of Botany, Department of Agriculture, Union of South Africa, the United States Department of Agriculture and the Smithsonian Institution have very liberally contributed. The Director of the Arnold Arboretum has presented a copy of *A monograph of Azaleas*, by E. H. Wilson and A. Rehder, and from the Director of the New York Agricultural Experiment Station *Sturtevant's Notes on edible plants*, edited by Prof. U. P. Hedrick, has been received.

The Controller of H.M. Stationery Office has supplied the library with a set of the Handbooks and Vocabularies compiled by the Geographical Section of the Naval Intelligence Division of the Admiralty, comprising 24 volumes; and Miss A. Lorrain Smith's *Handbook of the British Lichens* has been presented by the Trustees of the British Museum.

Under the direction of Dr. A. Chevalier 3 numbers, presented by him to the library, of a new *Revue de Botanique appliquée et d'Agriculture coloniale* appeared during the year. The library is also indebted to Dr. Chevalier for a copy of his *Exploration botanique de l'Afrique française*, tome i.

A considerable number of original drawings of plants, mostly coloured, have been received. Lieut.-Colonel W. G. King has presented 10 albums containing 842 paintings of Madras and Burmese plants, the work of the late Mrs. King. This collection includes representations of many species of Cucurbitaceae, showing fruits. Colonel King has also sent to Kew vols. 2 to 6 of Wight's *Icones Plantarum Indiae orientalis* and *The Ferns of Southern India*, by R. H. Beddome. A collection of 72 paintings and 8 pencil sketches of South African plants, by the late Mrs. F. G. Crossman, mounted in 3 albums, has been received from Captain Crossman. Messrs. F. Sander & Sons have presented an album of original drawings, chiefly dissections of the flowers of orchids, by H. G. Reichenbach, and with MS. lists of plants in cultivation at Kew, 1816-50, and other MS. and printed matter, Mr. R. J. A. Jackson has presented some original drawings of Bankia plants by Dr. T. Horsfield. Mr. Jackson's presentations were formerly the property of his father, the late Mr. J. R. Jackson, for many years Curator of the Museums, Kew.

The Executors of the late Mr. R. B. Chapman have presented a manuscript index, compiled by Mr. Chapman, to Solereder's *Systematic anatomy of the Dicotyledons*, translated by L. A. Boodle and F. E. Fritsch.

The following have been received as presentations: *Arbejder fra den botaniske Have i København*, nos. 94-97, from the Botanical Library of the University of Copenhagen; O. Beccari, and J. F. Rock, *A monographic study of the genus Pritchardia*, from the Director of the Bernice Pauahi Bishop Museum, Honolulu; *Botanical Survey of South Africa*, Memoir no. 2, from the authors, Mr. R. D. Aitken and Mr. G. W. Gale, also from the Director

of the Survey, Dr. I. B. Pole Evans; M. T. Cook, *College Botany*, from the publishers, Messrs. Lippincott; E. B. Copeland, *The Coconut*, ed. 2, from the publishers, Messrs. Macmillan; E. De Wildeman, *Contribution à l'étude de la flore du Katanga*, from the Comité Spécial du Katanga; *The Flowering Plants of South Africa*, edited by I. B. Pole Evans, vol. i. pts. 1-4, from Miss M. Smith; R. Kanehira, *Anatomical characters and identification of Formosan woods*, and supplement, from the Bureau of Productive Industries, Government of Formosa; *Malayan Science Bulletin*, no. 1, from Mr. F. W. Foxworthy; K. Miyabe and Y. Kudo, *Icones of the essential forest trees of Hokkaido*, fasc. 1-4, from His Excellency the Governor of Hokkaido; *The Orchid Review*, vol. xxix., from the Editor, Mr. Gurney Wilson; K. Rangachari, *A handbook of some South Indian grasses*, from the Director of Agriculture, Madras; *Recherches sur la répartition des plantes ligneuses croissant spontanément en Suisse*, pts. 1-4, from the Secrétariat de l'Inspection fédérale des Forêts, Chasse et Pêche, Berne; F. J. Smiley, *A report upon the boreal flora of the Sierra Nevada of California* (University of California Publications in Botany, vol. ix.), from the Manager of the University Press; F. Watts, *An introductory manual for sugar growers*, from Mr. J. H. Holland; T. S. Woolsey, jr., *Studies in French forestry*, from the publishers, Messrs. Chapman & Hall; and J. H. Veitch, *A traveller's notes*, from Mrs. R. A. Rolfe.

Among others who have made presentations to the Library the following should be mentioned as the donors of books or papers by themselves or in a few cases of other publications:—Mr. R. D. Aitken, Dr. G. E. Anastasia, Dr. G. Antonelli (*Calendario forestale italiano*, 1921), Dr. L. H. Bailey (*The principles of vegetable-gardening*, ed. 18), Mr. S. N. Bal, Prof. J. W. Bews, Prof. P. A. van der Bijl (6 mycological papers), Dr. G. Bitter (5 papers), Miss C. G. Bitting (*The effect of certain agents on the development of some moulds*), Prof. S. R. Bose, Mr. F. Bucholtz, Dr. W. Burns & Mr. S. H. Prayag (*The book of the Mango*), Prof. L. Buscalioni & Prof. G. Muscatello (*Studio anatomo-biologico sul gen. Saurauia*), Dr. E. Chiovenda (*La culla del cocco*), Messrs. W. G. Clarke & R. Gurney (*Notes on the genus Utricularia*, etc.), Dr. J. C. Costerus, Prof. A. X. Pereira Coutinho, Prof. W. G. Craib (13 papers), Miss K. M. Curtis, Mr. C. Davis (*A discourse concerning the irritability of some flowers*, by Dal Colvolo, 1767), Mr. J. Burt Davy (Map of Rhodesia), Mr. M. T. Dawe, Mr. M. Denis, Mr. Paul Descombes (9 papers on afforestation), Prof. G. B. De Toni, Dr. E. De Wildeman, Mr. K. Dinter (*Die vegetabilische Veldkost Deutsch-Südwest-Afrikas*), Mr. J. Doyle, Mrs. Elisabeth Ekman, Prof. A. J. Ewart (several papers by himself and his assistants), Prof. C. E. Fairman, Prof. P. F. Fyson (*The flora of the Nilgiri and Pulney hill tops*, vol. iii.), Mr. R. Gestro, Mr. W. B. Grove (*Monograph of the Pilobolidae*), Dr. H. Hallier (*Beiträge zur Kenntnis der Linaceae*), Prof. A. Henry, Dr. A. W. Hill (*Tropisches Gartenbau*,

1912, by H. Deistel, and a few publications relating to the Cameroons), Dr. B. P. G. Hochreutiner (34 papers), Mr. R. S. Hole, Dr. C. C. Hosseus, Dr. J. B. Hurry (*Vicious circles in disease*, ed. 3), Dr. J. Jeswiet (*Beschrijving der soorten van het suikerriet*, 8 parts), Col. H. H. Johnston, Mr. W. Jungman, Dr. Karl von Keissler, Mrs. Koorders (*Botanisch overzicht der Rafflesiaceae*, by the late Dr. S. H. Koorders), Mr. Lester-Garland, Mr. L. Lewin, Mr. C. G. Lloyd (several of his mycological writings), Mr. R. B. Loder (*Some notes on a few of the old and remarkable oaks in England*, typed), Capt. J. McDonald, Dr. C. Massalongo, Mr. W. R. Maxon, Mr. T. Nakai (*Flora sylvatica koreana*, pts. 9 & 10), Prof. I. V. Novopokrovsky, Dr. C. H. Ostenfeld (*Contributions to West Australian Botany*, part 3), Dr. B. Peyronel (several papers on plant pathology), Dr. H. Pfeiffer (*Revision der Gattung Ficinia*), Dr. E. P. Phillips, Mr. C. V. Piper (17 papers), Prof. S. J. Record (papers on timbers), Mrs. Clement Reid, Prof. J. F. Rock (*The Leguminous Plants of Hawaii*), Mr. S. Savage, Prof. J. H. Schaffner (14 papers), Dr. R. Schlechter, Dr. T. R. Sim (*Native Timbers of South Africa*, etc.), Dr. J. J. Smith, Dr. Otto Stapf (3 papers by Dr. Handel-Mazetti, and *Précis de Botanique pharmaceutique*, by L. Beille, vol. ii., 1909), Prof. D. Thoday, Dr. G. B. Traverso, Prof. W. Trelease, Right Rev. M. N. Trollope, Bishop in Corea (*Transactions of the Korea Branch of the Royal Asiatic Society*, containing his *Arboretum coreense*), Dr. H. W. T. Wager, Mr. C. T. White (31 papers, mainly on Queensland Botany, by himself and others). Prof. R. H. Japp (several papers from the Botanical Department of the University of Birmingham), and Dr. T. G. Yuncker (*Revision of the North American and West Indian species of Cuscuta*).

Additions to the Herbarium during 1921.—During the year about 19,400 specimens were received as donations or exchanges and 8,002 purchased, while 4,032 were received on loan.

The principal collections are enumerated below :—

EUROPE.—*Presented*: Britain; Cornwall, by Mr. Edgar Thurston; Orkneys, by Col. H. H. Johnston; Rubi collected by the late Rev. W. Moyle Rogers, by Archdeacon F. A. Rogers; Finland, by the Helsingfors University Botanical Museum; Spain, by Prince Roland Bonaparte; Flora Rumaniae Exsiccata, cent. 1, by Prof. A. Borzi.

Purchased: Adr. Fiori & A. Béguinot, Flora Italica Exsiccata cent. 25–26; G. Briosi & F. Cavara, Funghi Parasiti, fasc. 181 Dr. F. Petrak, Fungi Polonici, fasc. 1–18, Mycotheca Carpathica, fasc. 1–8, Fungi Albani, fasc. 1–8, and Cirsiotheca Universa, fasc. 15–18.

ORIENT.—*Presented*: Syria (coll. B. T. Lowne) and Orient (coll. Balansa), by Mr. C. E. Salmon.

NORTH AFRICA.—*Presented*: Egypt, by Mr. G. W. Grabham.

CHINA.—*Presented*: Kansu and North-Eastern Tibet, by the Rev. Frank D. Learner.

Purchased: Prof. C. S. Sargent, O. Schoch's collection; Dr. H. Winkler, Dr. W. Limpricht's collection.

INDIA.—*Presented*: Bengal, by Mr. H. H. Haines; Assam, by Mr. R. S. Hole; Chamba State by Mr. R. N. Parker; Tibet, by Lt.-Col. R. S. Kennedy; Himalaya and Lahore, by Mr. B. Sahni.

MALAY PENINSULA. — *Presented*: Various localities, by Mr. I. H. Burkill; Tahan and Kwala Lumpur (Coll. Seimund), by Mr. H. N. Ridley.

MALAYA.—*Presented*: Siam, by Dr. A. F. G. Kerr, Mr. A. Marcan and Mr. I. H. Burkill. Philippine Islands, mosses by Mr. E. D. Merrill, and orchids by Prof. Oakes Ames.

Purchased: Mrs. J. Clemens, Borneo, Mt. Kinabalu.

AUSTRALIA.—*Purchased*: W. A. Weymouth, Tasmanian mosses; Max Koch, Western Australia.

NEW ZEALAND.—*Presented*: Dr. L. Cockayne, seeds.

POLYNESIA.—*Presented*: Fiji, by Mr. W. Greenwood.

TROPICAL AFRICA.—*Presented*: Gambia, by Mr. M. T. Dawe; Nigeria, by Mr. H. V. Lely and Mr. T. Laycock; Angola and the Congo region, by Mr. J. Gossweiler; Belgian Congo, by Dr. E. De Wildeman and Mr. J. Burt-Davy; Portuguese Congo, by Mr. M. T. Dawe; Abyssinia, by Mr. G. W. Grabham; Mombasa, by Mr. T. D. Maitland; Uganda, by Mr. C. H. Lankester; Tanganyika Territory, by Mr. A. Leechman; Portuguese East Africa, by Mr. G. Coombes; Rhodesia, by Dr. I. B. Pole-Evans, Archdeacon F. A. Rogers, Mr. J. Burt-Davy, Mr. A. Hislop, and Mr. H. G. Munday. Plants from Dr. H. L. Shantz's expedition, by the U.S. Department of Agriculture.

Purchased: R. A. Dummer, Uganda and British East Africa; Dr. J. Mildbraed, Cameroons.

MASCARENE ISLANDS.—*Presented*: Mauritius, by Mr. H. A. Tempany.

SOUTH AFRICA.—*Presented*: Transvaal, by Dr. I. B. Pole-Evans and Mr. J. Burt-Davy; Griqualand West, by Miss M. Wilman; various localities, by Archdeacon F. A. Rogers.

NORTH AMERICA.—*Presented*: Trees and shrubs, by Prof. C. S. Sargent; Washington State, by Mr. J. M. Grant.

Purchased: W. N. Clute, Arizona; B. F. Bush, Arizona.

CENTRAL AMERICA.—*Presented*: Mexico, by Mr. J. Gonzalez Ortega; British Honduras, by Mr. C. Hummel; Panama, by Mr. W. R. Maxon.

WEST INDIES.—*Presented*: Various islands, Dr. N. L. and Mrs. E. G. Britton, and Mr. W. Fishlock; Danish West Indies, by Dr. F. Börgeson.

Mr. Edgar Thurston, C.I.E., has continued his investigation of the Cornish flora, and has presented the specimens collected

in 1920. A collection of Rubi made by the late Rev. W. Moyle Rogers, has been presented by his son, Archdeacon F. A. Rogers. The European herbarium formed by Miss E. A. Willmott, F.L.S. has been presented by her. Specimens collected in Syria by B. T. Lowne about 60 years ago have been presented by Mr. C. E. Salmon and supplement those already at Kew from the same collector.

The plants of the Mount Everest Expedition have been deposited at Kew for identification. A collection from Kansu and Tibet by the Rev. Frank D. Learner contained the rare *Gentiana striata*, Maxim. Various plants collected by Mohamed Haniff, Mohamed Nur, Seimund and others in the Malay Peninsula have been received and are being used by Mr. N. N. Ridley for working out at Kew his Flora of the Malay Peninsula. Dr. A. F. G. Kerr and Mr. A. Marcan have continued to send Siamese plants, and additional material has been also furnished through the exertions of Mr. I. B. Burkill's collectors. Philippine Island mosses have been presented by Mr. E. D. Merrill, and orchids from the same region by Prof. Oakes Ames. Mr. W. Greenwood has continued his work in Fiji and sent his specimens to Kew.

Tropical Africa, as usual, has furnished a large proportion of the material received during the year. From the western side interesting collections from the Gambia, Naraguta, and Yorubaland have been received from Mr. M. T. Dawe, Mr. H. V. Lely and Mr. T. Laycock. The Congo region has been explored by various collectors.

Various consignments from Rhodesia have been received through Dr. I. B. Pole-Evans, C.M.G., from the Department of Agriculture, Pretoria, as well as from the collectors enumerated above. Dr. I. B. Pole-Evans has also supplied other collections from Africa south of the tropic. Mr. Burt-Davy, who is working at Kew on the Transvaal flora, has presented specimens from that country as well as from other parts of Africa. Miss M. Wilman has continued to send plants from Griqualand West. Prof. C. S. Sargent, LL.D., has presented a valuable collection of specimens of North American trees and shrubs. Mr. J. Gonzalez Ortega has communicated from the Sinaloa region of Mexico an interesting collection which has furnished several novelties, including a new species of *Amoreuxia*. Dr. N. L. Britton has sent further instalments of specimens collected by himself and others in the West Indies.

Nearly 2,000 specimens of Marine Algae from the Danish West Indies have been presented by Dr. F. Börgesen.

The Genera Plantarum.—Bentham & Hooker's 'Genera Plantarum' is, in detail, a series of monographs of the orders of Flowering Plants. While the whole work is indispensable in

Herbaria and Libraries, individual parts are sufficient for the needs of botanists working at groups or orders contained in those parts.

Complete copies of the whole work are no longer available.

This is also the case with vol. i but part 2 can be supplied. It contains all *Calyciflorae* except *Connaraceae*.

Complete copies of vol. ii are all but exhausted but part 2 can be supplied. It contains the bulk of *Gamopetalae* except *Compositae*.

Vol. iii is especially important, complete copies are available; part 1 comprises all the genera of *Monochlamydeae* and *Gymnosperms*; part 2 the whole of *Monocotyledons*. The monographs of *Orchideae*, *Liliaceae*, and *Gramineae* are of outstanding interest. The disposal of the whole of the remaining stock affords the opportunity of purchasing separate portions.

W. T. T.-D.

Plant Collection from the Azores.—An interesting and valuable collection of Azores plants has recently been presented to Kew by Capt. G. A. Carew Hunt. This consists of about 600 specimens mostly collected in the island of St. Michael or San Miguel, Azores, by Capt. Carew Hunt's grandfather, Thomas Carew Hunt, who was from 1844–48 H.B.M. Consul for the Azores. The specimens are in good condition, unmounted and laid between sheets of brown paper. The present set was stored, apparently for many years, in the warehouse of Messrs. Joseph Barber & Co., Ltd., and it is largely due to the interest and good offices of this firm's Director, Mr. H. G. Pole, that the presentation was ultimately made to Kew. The package was addressed to the Botanical Society of London which became defunct in 1858 (*see* Druce in Rep. Bot. Soc. & Exch. Club, 1920, pp. 93–95).

Carew Hunt's Azores plants were worked out by H. C. Watson, who included them in papers published in Hooker's *London Journal of Botany*, vol. III., 1844, p. 582, and vol. VI., 1847, p. 380, and in Godaman, "The Azores," 1870. Mr. Carew Hunt himself published accounts of the islands of St. Mary and St. Michael in the *Journ. of the Roy. Geogr. Soc.* XV., 1845, p. 258, and included lists of plants.

Among the new plants collected by Carew Hunt and described by Watson there may be mentioned: *Vicia Dennesiana*, *Petroselinum Seubertianum*, *Ammi Huntii*, *Seubertia azorica*, and *Campanula Vidalii*. *Ammi Huntii* is figured in Trelease, "Botanical Observations on the Azores," in *Ann. Rep. Missouri Bot. Gard.*, 1897, Plate 23.

According to Watson (in Godaman, "The Azores," p. 262) Carew Hunt collected 375 species in the Azores, adding 67 species previously unrecorded from the islands, out of a then known total of 478 species of *Phanerogams* and *Vascular Cryptogams*.

W. B. T.

Emmenopterys Henryi, *Oliver*.—This interesting tree was first discovered by Prof. A. Henry in China and was originally described by Oliver in Hooker's *Icones Plantarum*, t. 1823. It was introduced to cultivation by E. H. Wilson in 1907 when collecting for the Arnold Arboretum. It is deciduous and is described by Wilson as attaining a height of 50 to 80 feet, with a trunk up to 9 or 10 feet in girth. The leaves are opposite, oval or ovate, tapered towards both ends, the larger ones 8 in. long by 4 in. wide, dark dull green above, pale beneath, with a pubescent midrib and veins; petiole reddish, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long. The inflorescence is a terminal flattish corymbose panicle, as much as 10 in. wide and 6 to 8 in. high. Corolla white, 1 in. wide, the base funnel-shaped, dividing at the top into five rounded spreading lobes. The calyx ordinarily is small, only $\frac{1}{4}$ in. long with five roundish lobes; but on a certain proportion of the flowers one lobe of the calyx becomes remarkably enlarged and develops into a large white-stalked oval "bract," the largest as much as 2 in. long by $1\frac{1}{2}$ in. wide. According to Wilson these bracts persist and change to pink as the fruits ripen.

A plant was obtained for Kew from the Coombe Wood Nursery in 1913 which has been grown out-of-doors without protection ever since and has not yet been injured by cold. Mr. Wilson, who found it near Ichang at from 2000 to 4000 feet altitude, was rather surprised when last at Kew by its hardiness. He describes it as "one of the most strikingly beautiful trees of the Chinese forests," and it is evidently a tree well worth a trial in the milder parts of our islands. The extraordinary development of one of the calyx lobes very much resembles the large showy bracts seen in *Schizophragma*, and the large trusses of these combined with the *Luculia*-like flowers must be remarkably handsome. The largest plant at Kew is a bush about 7 feet high and it may be some time before we see its blossoms. The genus, which belongs to the Natural family *Rubiaceae*, is monotypic and is most closely allied to *Luculia*. The family to which it belongs is but sparsely represented among hardy trees and shrubs.

W. J. B.